

SUPPLEMENT.

The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

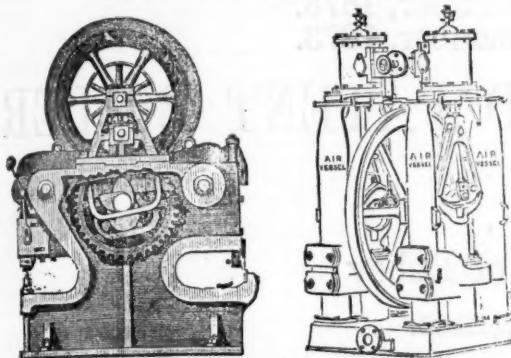
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LONDON, SATURDAY, SEPTEMBER 11, 1875.

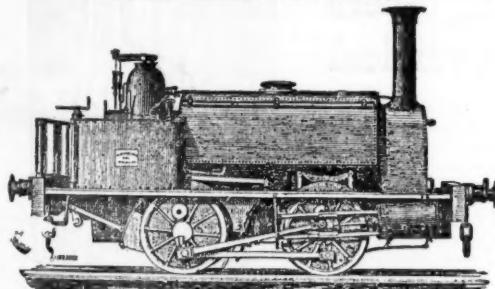
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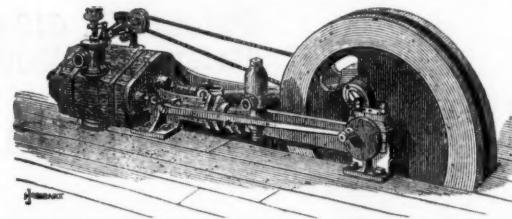
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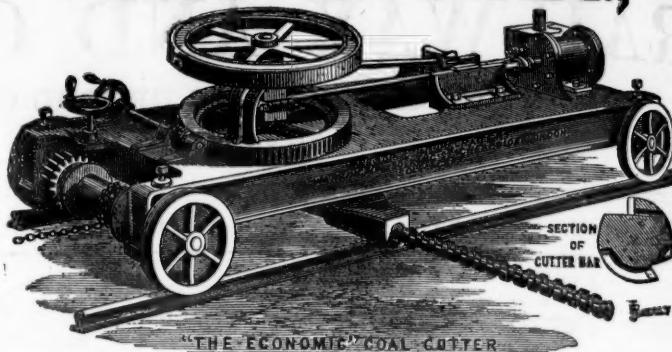
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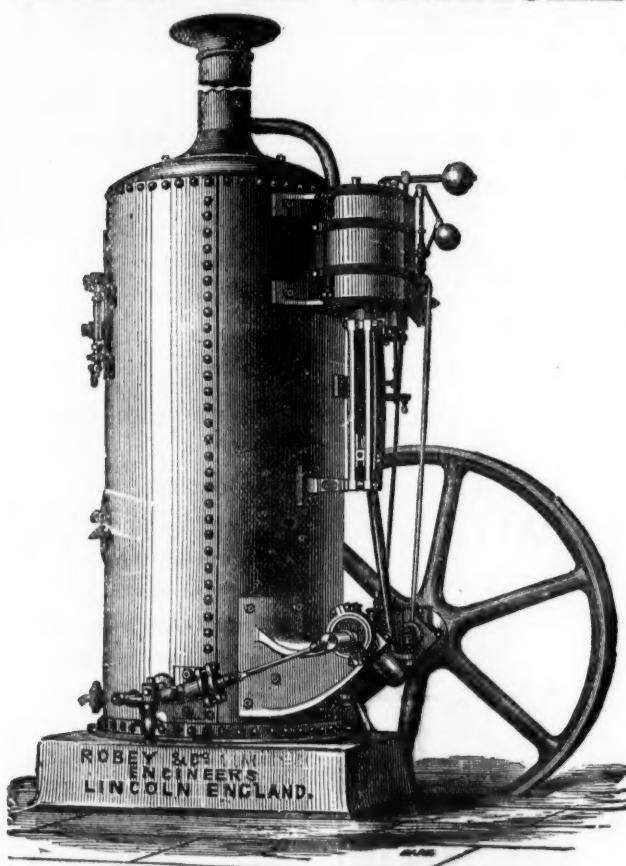
30, KING STREET, CHEAPSIDE,

LONDON, E.C.



Patent No. 4136 : : : : Dated 16th December, 1873.

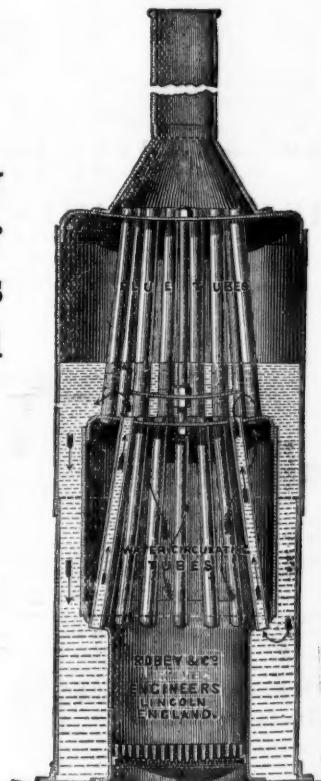
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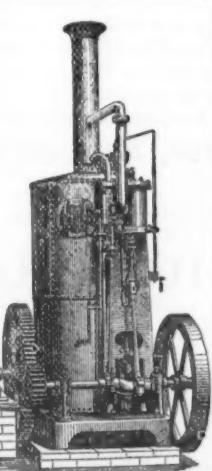
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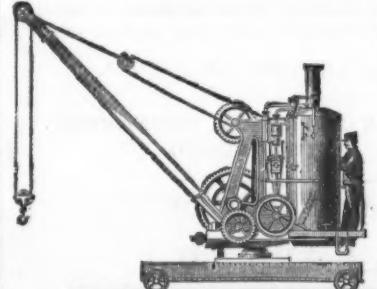
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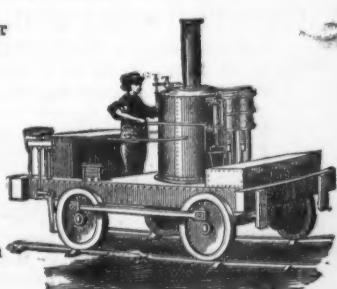
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Original Correspondence.

LYTTEL'S METALLURGICAL PATENTS.

When a man becomes weak and pallid he is generally prescribed a systematic course of iron in various forms of salt, and he learns, by a hard practical experience, that his strength, vitality, and social usefulness are largely dependent upon the richness of his blood in iron. The same law holds good with nations as with an individual in this respect, because in the present day poverty of iron in any land means social and political decay, whilst a rich circulation of iron through those commercial channels which are the veins and arteries of the State means strength and fullness of vital financial power. England has long enjoyed the most golden practical experience of this therapeutic fact, and any proposition tending to sustain John Bull's life-blood in its fullest vigour for his sturdy body is well worthy of our best attention.

The supremacy of Great Britain in the iron trade has generally been considered to be due solely to our great natural advantages through the abundant possession of coal and iron, but many other nations have long been known to possess still greater mineral wealth, without any corresponding prosperity thereby. The reason of this is now well understood in the trade, and is this—that our national position as "the old established shop" makes competition most difficult to all our rivals. It is unsafe, however, to rest satisfied with our present iron supremacy as secured either by the latter fact or by our mineral wealth, because foreign competition is a watchful rival—ready, able, and eagerly willing to seize any advantage through British indolence in the path of progress. That is the seriously weak point of our iron trade at present, because ironmasters have realised such enormous wealth from processes hoary with honourable age that they show no welcome, much less help, to any new means of production. It is not, however, a subject of any surprise to those who know much of the records of the Patent Office that such universal antipathy to all new inventions should exist, because it is, unhappily, the fact that the proportion of good to worthless patents is microscopically small. This, however, is no reason why all proposed improvements should be condemned and exiled for first adoption in other lands, and still less should this unreasoning course of universal rejection be applied to any process in the iron or steel trade, which might be silently adopted elsewhere to our hurt.

"Lyttle's* Metallurgical Patents," referred to in our advertising columns, relate to certain processes which have, without doubt, theoretical principles and the teachings of experience so completely on their side that they are well worthy of better fate, because they hold out a prize of imperial magnitude for a very trifling risk. The backbone of all these numerous home and foreign patents, or rather of the processes to which the patents relate, consists in a new method of applying heat for the deoxidation or "reduction" of the ore, under the operation of which the following remarkable advantages are laid down in Mr. Lyttle's various pamphlets on the subject as well-established facts:—

1.—That no matter how impure the ore may be, through the presence of sulphur, excess of silica, or phosphorus, the resulting metal is always absolutely the purest that can be made of its class, whether pig, malleable iron, or steel, and this, too, at a saving rather than an increase in the maker's cost.

2.—That the waste dust, or "duff," of collieries is the best possible form of coal for the manufacture of any of these metals under the new processes.

3.—That a kind of cheap peat charcoal, now wholly useless, which can be made by charring air-dried peat sods in clay-covered heaps on the bogs, furnishes the unlimited means of producing the finest charcoal pig and cast-steel, as well as the purest and toughest malleable iron.

4.—That, as all the ore employed must be in a crushed state, the new system will at once make available the whole of the disintegrated ore, which forms such a heavy item of loss in so many iron mines, and constitutes almost the whole mass of many vast deposits rich in metal in various parts of the United Kingdom, as well as abroad.

With fuel and ore thus set before us as available, which can now be had without any practical limit at the price of "dirt," it seems superfluous to go any further; but there is, nevertheless, another reduction in the proportion of fuel used per ton of metal made, upon grounds which cannot be refuted without unexpectedly adverse results on larger trials. We shall not, however, consider the question at all in this aspect, because if Mr. Lyttle should produce a pure metal uniformly from an impure ore he will have furnished the key to unlock the gates which now wholly debars the use of tens of thousands of millions of the richest and impure iron ore in England alone. The utilisation of disintegrated ore is a question of far greater magnitude than people generally suppose, because in many of the richest workings of hematite a very large proportion of that ore has to be turned over as abandoned waste, because it does not exist in that lump form without which it could not be smelted in the old process. Immense deposits of hematite ore have been discovered lately in various parts of the North of Ireland; but in most cases only 5 percent. of the ore raised is of any use, because the remainder is all like gritty incoherent red earth.

We trust that these remarks about the richness of the harvest to be won under "Lyttle's Metallurgical Patents," if proved as successful as they promise, will, doubtless, have whetted our readers' appetite for some details of the patentee's *modus operandi*, and we are happy to be able to say that, from their singularly practical simplicity, the inventions are quite as easy to comprehend as to describe. In all these processes Mr. Lyttle takes advantage of the great power which carbon is known to possess as a reducer of ferric-oxide when the carbon and oxide are thoroughly incorporated in a crushed or powdered state. He also refutes those who uphold carbonic oxide to the exclusion of solid carbon, and claims in their favour the brilliant researches of Mr. I. Lowthian Bell, by referring them back to the perusal of Mr. Bell's work on the smelting of iron, in which they will find the fact, not fully appreciated till now, that Mr. Bell proved the deposition of solid powdered carbon from carbonic oxide to occur at such low temperature as to afford good reason for assigning to the solid carbon thus minutely deposited in the matter of the ore the whole reducing power hitherto ascribed to carbonic oxide as a gas. The fact, however, that powdered fuel mixed and heated with powdered ore, with total exclusion of free oxygen, is both a rapid and easy means of reducing the ore *without the presence of any carbonic oxide flame* is one which is old in the knowledge of all assayers, and does not admit of question.

Starting, then, from this solid fundamental principle, Mr. Lyttle describes several simple, cheap, and roughly "go-ahead" methods of carrying out his process of converting the crushed mixture of ore and fuel into lumps preparatory to passing it through the blast-furnace, which he turns to his own account with the most conservative care. In fact, "Conservatism with practical reform" is the promising feature which commends the whole propositions of this patentee. There are various materials available for consolidating this mixture into lumps, but clay is that upon which most dependence appears to be placed, and at this point the primary and well-known reducing principle followed becomes divided in its application in Mr. Lyttle's hands into two marked and most distinctly separate processes. One of these is for the production of the fusible carbide or pig-iron, and, as the complete fusion of the entire contents of the furnace is essential for that purpose, he adds to the crushed ore and fuel such fluxes and in such proportion as may be found on trial to be necessary, these also being in a powdered state. The other great section of this invention is called the reducing process, and is totally incompatible with the production of pig-iron, because the total and invariable exclusion of all fluxing or fusion of the furnace-charge is essential to its success. For this reason the former is designated the smelting process, and the latter the reducing process. In the latter process the iron is brought to the metallic state as an impalpable powder or dust, commonly called "sponge," and in both processes the flame which provides the reducing heat does so by direct permeation amongst the agglomerated lumps of ore.

In both processes these lumps are subjected to the action of an

ascending flame in a vertical blast-furnace, but here the similarity is totally at an end, because the reducing furnace-shaft has no contraction or "bosches," and no hearth, its bottom or lower part being continued of the same diameter vertically downwards as a cooling cylinder of iron. The upper part of this reducing furnace, in which the flame acts, will be built in the ordinary way adopted for iron blast-furnaces so far as structural details are concerned. At two or more points around the bottom of this reducing shaft, and immediately above the top of the cooling cylinder, there are large openings, lined with gannister, through which a carbonic oxide flame enters by the propulsion of a blast, which generates the required volume of flame in side chambers, either in any ordinary well-known way of producing that gas from coke, or in a peculiarly simple and self-regulating method devised by Mr. Lyttle, which cannot be described without drawings like those in his pamphlets.

It should be carefully noted by all who wish to arrive at an impartial judgment of the real merits of these inventions that, neither in this method of conveying flame through side apertures into the reducing shaft, nor in a similar method specified for keeping the burning fuel outside the smelting-furnace with like openings below the bosches in the smelting process, does the patented attempt to produce the whole of the required heat in external combustion chambers. No more blast is forced into those chambers than suffices to produce the required volume of carbonic oxide flame, and as all the oxygen of the blast must thus enter the reducing shaft in that form of combination with carbon, Mr. Lyttle augments the heat at the points where the flame enters the furnace to any desired intensity, by partially consuming there the red-hot carbonic oxide. This is done by arranging extra blast tuyères, which throw a hot or cold blast against, or in the face of, the carbonic oxide flame, just as it is about to enter the furnace, and this combustion of the carbonic oxide, which must not be complete, results in the evolution of intense heat. Seeing, however, that this heat will only be developed at the points where it is wanted, and not in the side carbonic oxide chambers, there is no room for waste. Its intensity is also completely at command by regulating the force and volume of the blast, which Mr. Lyttle does not believe will ever be needed in a hot state.

This mode of totally and efficiently separating the heating from the reducing functions of the fuel consumed is a peculiar feature of the new process, because, if pure carbonaceous matter or fuel is employed in compounding the agglomerated lumps of crushed ore as the reducing agent, any fuel, however impure, may be consumed with safety as the source of the heating or carbonic oxide flame.

In the smelting process when the smelting heat is provided upon this principle an intense heat is required, but much less powerful, it is anticipated, than under the old plan, because it is well known that the close incorporation of the ferric-oxide and reducing carbon, as well as of the fluxing ingredients—such as silica, lime, and alumina—will result in the much more speedy completion of all the required reactions. The smelting process is that which is best calculated, in Mr. Lyttle's opinion, for the production of iron from a very impure ore, because the incorporated quicklime makes its own of the whole of the silica, sulphur, and phosphorus of the ore with which it is intermixed long before the iron is reduced to the metallic state. In the reducing process lime may also be employed as a purifier, but with this precaution, that the proportion used shall be either too much or too little to form a slag with the gangue of the ore.

When iron has come to the metallic state under the smelting process it speedily absorbs from the intermixed carbon that surcharge of carbon which turns it into grey pig, and this metal is tapped off from the hearth in the usual way. Such is not the summary conclusion in the reducing process when the metal is brought to the powdered state, because it must become nearly cold in the cooling cylinder before it can be exposed to the air by removal at the bottom. At this point another and singularly beautiful contrivance is patented by Mr. Lyttle, who after grinding the brittle reduced "compound" to dust runs it through a winnowing machine, and thus separates all the constituents according to their specific gravities. The powdered iron falls nearest to the blast, the other minerals next, whilst the carbon, which this "knowing dodge" is intended to remove, is blown to a much longer distance. By this means the whole of the redundant carbon of the compound is completely eliminated, and with it the danger of converting the powdered iron in its subsequent treatment into carburetted pig.

The iron dust thus purged by the blast is invariably the purest malleable iron, provided that no more carbon has been mixed with the ore than sufficed for its deoxidation; but if a larger proportion, or redundancy, of carbon was employed, and the descent of the reduced metal not too much accelerated, the whole of the powdered iron will be found to have undergone "cementation," and to have thus passed into powdered "blister" steel. The finely divided and porous reduced iron is rapidly affected by the intermixed red-hot carbon, and hence the great economy as well as speed of this method of making that which only needs melting to be the finest homogeneous cast-steel at a lower cost than the commonest iron. In stating this we take for granted the detailed estimate given in Mr. Lyttle's pamphlet.

As this point Mr. Lyttle adopts one and the same means of putting into marketable form the powdered malleable iron and powdered steel, and that is by working the powdered metal into lumps with clay and powdered fluxes, such as lime and sand, in such proportions that the lumps shall not melt into slag until the melting point of steel or the welding point of malleable iron is first reached. By mixing the powders of malleable iron and steel in various proportions we can thus obtain a malleable iron of any desired hardness, and a steel of any required softness.

In these lumps of reduced metal there must be no trace of free carbon, and when malleable iron is required in blooms the consolidated lumps of that metal are piled on the hearth of a puddling furnace, where they soon collapse, and leave their contained metal pure and ready to be worked into bloom. The rotary furnace seems just the thing for this, because the fettling difficulty will not exist with metal containing no impurity to be removed. In the case of steel, the lumps are to be charged into a vertical blast furnace, identical in all respects with the common iron smelting furnace, but for this difference it is worked entirely by the combustion at its crucible of a carbonic oxide flame generated in side furnaces, as described above. This completely prevents the contact of the powdered steel with carbon, and from the hearth will flow off the protecting slag, whilst the finest cast steel can be tapped off for casting into pigs or ingots like pig-iron.

Mr. Lyttle provides for the completion of the cementation of reduced iron apart from the reducing furnace, so as to enable the ultimate duty to be obtained therefrom, but this description is already of too great length to admit of dealing with these points. To the owners of peat lands these inventions hold out the highest promise, because with no more costly plant than spades, or a labour-saving digging machine, they can turn their useless bogs into profitable farming land, with proper drainage, at a profit upon the work instead of a loss. The great difficulty, however, experienced by Mr. Lyttle is to get ironmasters or capitalists to believe that, even upon these easy conditions, peat charcoal can be obtained in sufficient quantity, and it is, therefore, the duty of every owner of such land to accept Mr. Lyttle's invitation, which is to write to him and say whether such terms of supply would be agreeable to the writer. In other words, whether if the peat owner saw that he could make and sell this crude charcoal at a profit he would do so, and how many acres of bog he may possess. If this proposition were well made known through the provincial press, Mr. Lyttle would soon be furnished with a directory to peat lands, which would give to ironmasters that confidence in the character of the supply which alone is now needed to raise peat charcoal to the first rank as a metallurgical fuel. It will be seen from his advertisement that Mr. Lyttle will not sell his British patents, or seek any reward save as a sharer with those whose prosperity he may promote as makers of iron and steel.

The following authentic statistical figures will serve to show that the supply of peat charcoal for these new furnaces is practically unlimited, even when allowing that two-thirds of the recorded acreage of peat scattered in various parts of the Eastern Counties—Cambridge and Lincolnshire, with considerable tracts in Yorkshire,

Lancashire, and all over the North of England. The Highlands of Scotland and the Western Islands have a still greater wealth of peat, but Ireland's possession of this hitherto almost useless material is enormous. The total area of all these sources of supply in the United Kingdom is authoritatively put down at more than 6,000,000 acres. It is also a well-ascertained fact that 1 acre of bog yields, on an average, 1,000 tons of charcoal, so that, allowing only 2,000,000 acres of bog to be available, this alone would represent 2,000,000,000 tons of peat charcoal for the new industry.

Assuming that the total present make of iron and steel in the United Kingdom were increased by 50 per cent., the above charcoal, if used with *colliery dust as the heating agent* in the proportions laid down by the patentee, would make all that vast production of metals for the next 400 years.

THE MINERAL STATISTICS OF THE UNITED KINGDOM.

SIR,—In a leading article on "The Coal Question" in last week's Journal, the writer says, referring to Prof. Jevons's computations, that he bases his calculations on the returns given yearly by Mr. Hunt, which were not compulsory, and, therefore, not reliable. As this statement, if not corrected, must tend to destroy all confidence in the "Mineral Statistics of the United Kingdom," I have to beg that you will insert the following statement from the "Introduction" to the volume for 1873, which clearly sets forth all the sources of information which are made available:—

To the largest number of the coalmasters of the United Kingdom a circular was sent, soliciting a return of the coal raised from their collieries in 1873, and other information. Two-thirds of the circular issued were promptly returned, with the questions most fully answered. Several coal mining associations furnished me, in confidence, with exact information; and from the overseers of several parishes I have received similar assistance. In addition, the production of large districts, collected with great care, was placed at my disposal. The information thus obtained has enabled me to compute, with accuracy, the production of collieries amounting to more than 120,000,000 tons.

All the great coal-carrying railways of the United Kingdom, and several of the canals, have furnished the most detailed returns of the coal carried from each coal field, and its distribution, frequently giving, in confidence, the collieries from which it was obtained. All the shipments of coal, both to foreign parts and coastwise, are furnished by order of the House of Commons, and all the collieries sending coal to within the London district are given in the City of London returns. Nearly all the ironmasters have furnished me with the quantities of coal used in their works from their own collieries, or purchased from others. From the information thus obtained I have been enabled to compute that about 7,000,000 tons of coal were produced beyond the quantity named above.

I have, as stated, given the quantity of coal produced in 1873 as 127,016,474 tons, and from the checks which I am enabled to put upon the returns furnished to the Mining Record Office I can, with the utmost confidence, assure you and your readers that that return is strictly reliable.

While I am writing you, permit me to state that the "Mineral Statistics for 1874" are very nearly completed, and that I deeply regret the delay in publication, which has been entirely owing to the serious failure of my health.

ROBERT HUNT, F.R.S.,
St. Agnes, Cornwall, Sept. 8. — Keeper of Mining Records.

COPPER MINING ON LAKE SUPERIOR.

SIR,—In again laying before your readers some remarks concerning our Lake Superior Mines, allow me to mention the amount of mineral raised from the commencement of mining here in 1845 up to 1873. The amount also this mineral produced in ingot copper, and the amount of money realised from the same:—

	Mineral raised—tons.	Ingot copper—tons.	Value.
From 1845 to 1854	7,642	From 1845 to 1858	\$9,000,500
1854 to 1858	11,512	In 1858	1,886,000
In 1858	4,100	1859	3,800 ... 1,890,000
1859	4,200	1860	4,800 ... 2,610,000
1860	6,000	1861	6,000 ... 3,387,500
1861	7,500	1862	8,000 ... 3,402,000
1862	9,982	1863	6,500 ... 4,420,000
1863	8,545	1864	6,500 ... 6,110,000
1864	8,472	1865	7,000 ... 5,145,000
1865	10,791	1866	7,000 ... 4,760,000
1866	10,576	1867	8,200 ... 4,140,000
1867	11,735	1868	9,935 ... 4,592,000
1868	13,049	1869	12,200 ... 5,368,000
1869	15,288	1870	12,946 ... 5,696,240
1870	16,183	1871	12,857 ... 6,171,360
1871	16,071	1872	12,132 ... 7,774,720
		Total	Tons 176,985 Total ... \$76,333,320

I have laid before you the amount of dividends declared in seven mines, amounting to \$11,570,000, and the amount of assessments called to place these mines in a paying condition being \$1,691,000, leaving a profit of \$9,879,000. I next showed a couple of mines which have declared dividends, but have made assessments much heavier than the dividends declared. The next class of mines is those making assessments, but not having declared any dividends up to 1873, and the amount of assessments each one called in:—

Mines.	Mines.	Mines.	
Adams	\$100,000	Keweenaw	\$100,000
Adventure	100,000	Knowlton	180,000
Aetna	140,000	Lake Superior	40,000
Albany and Boston	156,000	Madison	120,000
Algoma	65,000	Mandan	65,300
Allonez	298,000	Manhattan	110,000
American	29,000	Mass.	98,800
Amygdaloid	470,000	Medora	38,400
Arnold	30,000	Mendota	147,500
Atlas	40,000	Merlinac	117,900
Atzec	150,000	Mesnard	159,000
Bay State	385,000	Michigan	

and should come well recommended, and then not trust them without a cashier or some check; but here is an entire stranger trusted with keeping men's time and paying them, and handling alone all the gold. Several directors have been out here, but what do they know of a mine? They go about San Francisco, and get a favourable report—but facts are stubborn things, and the workings ought to show the management incompetent. Have the property examined by some honest practical mining man—Mr. James White—who is well known to Mr. Henry Hughes as an honest, reliable man, and has condemned several mines intended for London. He is now in this city.

San Francisco, Aug. 16.

AN ENGLISHMAN.

RICHMOND CONSOLIDATED MINING COMPANY.

SIR.—The official circular which appeared in the Journal of Saturday last was so clear and explicit that anyone really desirous to do so could not possibly fail to draw the inevitable conclusion that the company's financial position at the present time is in a much more satisfactory position than heretofore; that the enormous outlay incurred in placing the mine in a most effective working condition, amplifying its profit-giving capabilities not only by an expansion of the scale of operations, but by the introduction of economic improvements, has been met by revenue, and that the mine is far richer, more permanent, and its general condition and prospects incomparably more encouraging than at any previous period in its history.

In face of these irrefragable facts, attested by realised results, proved by accrued and accruing profits, there are those who (to suit their own avaricious ends) ignore the most palpable evidence, disseminate the most glaring inconsistencies, contort every fact, and by the most shady inuendoes disparage everything that stands in the way of their base purpose. It has been said, "That the mind in its place and of itself makes hell of heaven and heaven of hell;" and pre-supposing that the emanations of such dangerous missiles really have been endowed with that attribute known as mind, the above quotation at once becomes a tremendous truth. But my more immediate purpose in addressing you upon this occasion is to point out how easily—at least in some matters—self-interest becomes transformed into malignity. All shareholders in the Richmond Company have been for some time past involuntarily favoured with "private and confidential" communications, post-cards, and even telegrams, from utter strangers, advising the "immediate sale of the shares." These now hackneyed devices ceasing to produce any effect whatever upon experienced shareholders, other expedients have been resorted to, and among others the publication of statements "that the company is largely in debt." The mine by developments and acquisitions having now proved itself to be of far greater value than even the vendors or promoters had estimated, is no longer the target of adverse operators, hence its financial position is mercilessly and dishonestly attacked. We are now told in all apparently sober earnestness "that the company is in debt 100,000£," and as if this extraordinary mis-statement were not audacious enough, it is made to appear to be part of the official circular, published in your columns last week.

What in common sense can this possibly mean, when we are unequivocally and honestly informed by our directors that, "As statements are being constantly made and circulated to the effect that the company is in debt to a large amount, the directors are anxious the shareholders should know that the amount of the indebtedness is more than covered by the gold, silver, and lead either in the hands of the bullion agent or at the company's works."

Shareholders! let us use our common sense, and do not allow ourselves to be hoodwinked by those who want our shares at low prices to supply sales made some time since when higher quotations ruled.

Sept. 8.

A SHAREHOLDER.

NEW QUEBRADA COMPANY.

SIR.—I have frequently seen letters on the subject of the above company in the Journal, and am rather surprised that there have been no complaints of late of the way in which information is so persistently withheld by the directors. Our half-yearly meetings are not held with the regularity they ought to be, and between those periods we are kept entirely in the dark as to what is going on. We see frequent, and sometimes rather violent, fluctuations in the prices of the shares, but the causes, if any exist, are studiously kept from us. All sorts of reports are constantly spread about in the neighbourhood of the Stock Exchange of a more or less discouraging character. Sometimes it is reported that the ore proves to be of little value, and at others that the railway is washed away as soon as it is made, or sinks in the swamps.

It is impossible that these reports can altogether escape the notice of the directors or their officers, and yet the most simple means for relieving the minds of shareholders are neglected. Other mining companies inform their shareholders periodically of what is going on. Why should not ours? We were told a year ago by our Chairman that there were 100 men at the mines under a very competent miner, and by this time it ought to be known whether or not the ore comes up to the expectations always held out to us, both as to quantity and quality. Then as to the railway, we know no more than we did six months ago as to how much of it is completed, or whether there is any certainty that it ever will be finished.

No man condemned for years more constantly or more justly the way in which all reliable information was withheld by former boards than did Mr. Consul Hemming, and I, therefore, expected when he came upon the board, and still more when he was made managing director, that we should have a very different state of things. If he and his co-directors wish to retain the confidence hitherto reposed in them they must take the shareholders in return more into their confidence. I cannot believe that the withholding of information can arise from any desire to save trouble, and still less from any wish to conceal the truth, and I am convinced that periodical statements to the shareholders, with such information as is fairly due to them, will prevent many a timid holder from sacrificing his property.

AN ORIGINAL SHAREHOLDER.

THE NASCENT COPPER PROCESS.

SIR.—I have watched very carefully the correspondence in your valuable Journal upon the above subject to see if there is really anything new in the process, or if it is likely to prove a tenth part as valuable to the mining interest as it is stated to be. I have also read with great care the patent specification, and from all that I have been able to gather I have failed to find anything new or novel in it; in fact, all the operations described in the specification has been carried out years since by those who have been engaged in working burnt Spanish ore by the wet process, better known to the public as Henderson's process. As far as I have been able to gather, the Nascent process consists in first grinding the ore to powder, calcining the same in suitable furnaces, conducting the fumes from the furnaces into chambers or flues, condensing the arsenic when present in sufficient quantities into white arsenic, or oxide of arsenic, As_2O_3 , and the sulphur, with the addition of nitrous gas into sulphuric acid $H_2S O_4$. The calcined ore is then mixed with sulphur and again calcined, converting the silver and copper into soluble chlorides, and condensing the fumes from the second calcination into hydrochloric acid, HCl . The ore when sufficiently calcined is removed from the furnaces and placed in suitable vats or tanks and lixiviated by the means of hot brine—salt and water. The liquor from the lixiviating vats being run into suitable vats, and the silver and copper contained therein precipitated together by the means of wrought (light) scrap iron.

The above is, as far as I have been able to gather, the Nascent Copper Process, if I am wrong in my conclusions I shall be glad if someone connected with and better informed on the process will set me right through the Journal.

There is just two other questions upon which I desire to be enlightened by the patentee. The first is how does he propose to separate the silver from the copper contained in his precipitate, or where can he find a market for precipitate containing both metals so as to get the value of the silver contained therein? The other is how does he manage to get a profit out of working ore containing 1 per cent.

of copper and 4 ozs. of silver per ton after paying for mining it? When the working expenses in connection with the wet process as worked in treating burnt Spanish ore at St. Helena, Wednes, Newcastle-on-Tyne, and other places, costs from 22s. to 28s. per ton of ore worked, and they have all the advantages of cheap coal, iron, salt, long experience, and one class of ore to treat. If the proprietors of the Nascent process can calcine 15 tons of ore with 15 cwt. of coal, as Mr. Barnard states he can in last week's Journal, he will find the best field for his operations in his treatment of burnt Spanish pyrites, as the present expenditure of coal is from 4 to 5 cwt. per ton of ore calcined, and the time of calcination 7 to 7½ hours. I await a reply, and trust my letter will be taken in the spirit in which it is written, to obtain information.

C. E.

THE NASCENT COPPER PROCESS.

SIR.—The "impassioned lines" that flow from Mr. Barnard's pen are always agreeable and diverting. They have been too long absent from your columns, and, therefore, when they greeted me in last week's Journal I was so pleased as to readily overlook the exuberance of feeling which caused their writer to lose sight of the distinction between purely personal questions and those of public interest. What Mr. Barnard says about his special furnace is not too highly coloured. I have seen the furnace in operation, and I consider it a great improvement upon the means of chloridisation usually employed, though when we consider that some hundreds of thousands of tons of ore are annually chloridised at a good working profit by ordinary furnaces I think we must ask Mr. Barnard's leave to regard his statement that "the system of chloridising has always been an arrant failure," as simply intended to show us what he really means by a "Barnardian rhapsody." The world is wide enough for us all, and Mr. Barnard should remember it was only when the counsel had a bad case that he was advised to abuse the attorney on the other side.

As regards the "log-book or diary" of the Nascent copper works at my mines, I shall be very pleased to give Mr. Barnard all the information he desires. The summary of our experience is that the cost of treatment averages about 16s. per ton, and may be considerably reduced by alterations in our furnaces and in our arrangements for transit and crushing, which alterations will be shortly carried out. As it is, however, even with a thus needlessly high cost of treatment, the process shows a very satisfactory rate of profit, each furnace at work treating from 70 to 80 tons of ore every four weeks, and producing about 3 tons of precipitate, saleable for about 60/- per ton—or, in other words, netting a clear profit of over 30s. for every ton of ore treated. And this, it must be remembered, results from the treatment of what other people would and do throw away as rubbish of no value—i.e., from the treatment of mundic which has already been burnt for arsenic, and yielded a fair profit over the costs of mining, dressing, and burning. Surely this is no slight achievement. Where can a parallel industry at once so remunerative and so free from risk be found? Mining pure and simple cannot approach it. Dolcoath, for example, yields an average profit of only 4s. or 5s. upon every ton of stuff raised. Ironstone miners are content with a profit of 1s. 6d. or 2s. per ton. Coalowners just at present think themselves well off with 1s., and yet Mr. Phillips, Mr. Barnard, and I are with ease and safety earning a profit of from 10s. to 30s. per ton by the treatment of stuff at surface, and free from all elements of speculation.

Mr. Barnard's reference to "the enormous piles of ashes, the residue of arsenical ores lying at the West of England Works and Kelly Bray," as being accounted for by a "confession rendered and endorsed that they are of no commercial value, even by the aid of the Nascent process," is founded upon a misapprehension. He admits them to contain 1½ per cent. of copper and 4 ozs. of silver to the ton; or, in other words, to contain 20s. + 10s. = 30s. of marketable value in copper and silver; which, seeing that such value is extractable at a maximum cost of 16s., leaves a handsome profit even if some waste in the process is allowed for. The truth is that the piles of burnt ore in question have been accumulated partly for the purpose of being specially treated for tin, and partly for the purpose of being mixed with raw ores other than arsenical mundic before being put through the Nascent copper process, by which plan I shall be enabled to profitably utilise an additional quantity of poor lodestuff. Of this intention neither Mr. Barnard nor Capt. Knott seems to have been aware, but I make bold to say that in the next balance-sheet of the West of England Company these disregarded ashes will be found to have contributed no insignificant amount towards the dividends to the shareholders.

Turning now, to the letter of your correspondent, "A. S. Y." I can only say that I shall be very happy to enter into arrangements with Wheal Crebor, or any other mine that desires to derive a profit from low-grade ores instead of treating them as so much ash. Already numerous communications have reached me from various parts of this country and abroad, and several important contracts have been entered into, and are in negotiation, with the Profit Union (Limited) and the Metal Trust. By the system which we have adopted of arranging to give a definite price for all ore delivered at our works, such works being wherever practicable erected on the mine itself, much complication is avoided, and mines secure a definite steady increase to their returns without any corresponding augmentation of their working expenditure. They are thus not invited to enter upon any experiment, but are simply provided with the opportunity of enlarging their sales of ore. It will, indeed, be surprising if they shall for the most part be found to neglect this source of dividend.

STEPHEN H. EMMENS.

Union-court, Old Broad-street.

THE NASCENT COPPER PROCESS.

SIR.—It is quite refreshing to see your old correspondent, Mr. Barnard, again in print. I consider his letter of last week a plain, matter-of-fact, sensible production, made palatable, at usual, with a little spice of humour. I am a novice, unfortunately, in a great deal that pertains to practical mining and chemistry, but shall look with increased interest for your Journal every week, as I anticipate a war of words and some highly amusing, as well as instructive, scenes between Mr. Barnard and his combatants. He has my best wishes, and I sincerely trust, to use his own favourite expression, that he will win success, and the united applause and thanks of the mining community by "turning beggary into wealth." I can speak feelingly, as I have within the past ten years speculated in seventeen different mines, all pronounced promising, and most of them have made some sales of mineral, but, without a single exception, the whole lot have turned up blanks by continually dragging money out of my pocket.

SUBSCRIBER.

THE NASCENT COPPER PROCESS.

SIR.—I fully thought Mr. Barnard had received his quietus forever, but he seems to have been only "scoot, not kill." His letter of last week is enough to gull a nation, as if he can only accomplish one-half of his statements we should have nearly every mine in England paying dividends, instead of making calls, but once bitten, twice shy. Mr. Barnard has promised much, and his failures are not yet forgotten. I do not wish to throw cold water upon the efforts of anyone; but it seems so utterly ridiculous for a man who a few years ago had never seen a mine to be causing a revolution in mining, and patenting furnaces and processes for working ores of no value. Of course, we all know that there is any quantity of lodestone material throughout our mining districts giving 1 per cent. copper and 4 ozs. silver, and we equally know it is impossible to work them to profit, or better men than Mr. Barnard would long ago have been successful. I trust my few remarks will not be in vain, and that the public will be wary, and not leave the substance to rush headlong after a shadow.

CAUTION.

THE NASCENT COPPER PROCESS.

SIR.—I have no doubt that Dr. Emmens and Mr. Barnard can, by their united energies, the Nascent Copper Process, and improvements in furnaces, &c., extract as much as 85 or 90 per cent., perhaps 95 per cent., of the copper and silver contained in ores; but, unfortunately, the poverty of English ores is too proverbial. I notice that Mr. Barnard last week, through the columns of the Journal, with his usual sanguine temperament, calculates our tin mines at 45 lbs. tin per ton of stuff. I guess rather some of our tin mines would like to have such an average; he is just as far wide of the mark when he states that there are large quantities of stuff giving 1 per cent. copper and 4 ozs. of silver, which exist only in his fevered imagination. Scientific gentlemen like Dr. Emmens and Mr. Barnard should leave the poverty-stricken mining field of England, and ventilate their talents upon foreign mines, where the ores thrown away are richer than the product of this country, when dressed and sold to the smelters.—London, Sept. 5.

PRACTICAL.

SIR.—Your correspondent of last week, Mr. Barnard, proposes to work mines and profitably treat low-class ores giving as little as 1 per cent. copper and 4 ozs. of silver per ton. May I enquire what he allows for raising the ores to surface apart from the cost of extracting the silver and copper? By his own figures, the ore is

only worth 25s. per ton, and practical experience, certainly not as a miner, but as a mine shareholder, convinces me that every ton of such ore raised would cost more than the 25s. What will "echo" now answer? I pause for a reply.

Birmingham, Sept. 7.

ONE OF THE VIRTUOUS LADY SHAREHOLDERS.

THE TREATMENT OF LOW-CLASS ORES.

SIR.—I have lost much money in mining, and should like to regain it. I have not rushed recklessly into speculations, but have taken the advice of respectable London authorities, and placed my eggs in many baskets. My complaint is that the whole of the eggs or the baskets are bad. I do sincerely trust that Mr. Barnard, English mining successful. It is never too mend, as his letter of last week proves, and I have always had faith in his sincerity that he would ultimately succeed in treating low-class ores, and raise from the Slough of Despond those who have their capital embarked in mines.—Manchester, Sept. 7.

FAITH.

WHEAL AGAR—THE BORING MACHINE.

SIR.—I am glad to see that "N. O. R." has drawn attention to the subject of publishing reports from time to time (say, fortnightly) of the proceedings at the several mines. In the case of Wheal Agar, which he refers to, I see little about it, and hear less, yet am most anxious to know what is doing there, and what result has been obtained by the boring machinery—a scheme, I understand, of one of the committees, I at least for one will be glad to see fortnightly or weekly reports from this mine, stating exactly what the mine is like, and the result obtained from the boring machine.

S. T. U.

GOLD IN WALES—NO. III.

SIR.—At a meeting of the British Association, held at Manchester in 1861, I had the temerity to read a paper "On the Occurrence of Gold in Merionethshire," which was, of course, subjected to a good deal of curious criticism at the time. (See Transactions of the Sections, 1861, p. 129.) In that paper I believe I made the first public record of 1 cwt. of gold having been obtained from the Crown lands of this country, and that 976 ozs. of which was got from 3 tons of quartz. This was undoubtedly done by Capt. John Parry, of Glanrwyd, who has recently written me as follows:—"I assure you that I made the first 5 cwts. of gold in this island (at least the first known of). I believe this to be true, also.

I shall have to refer to the above-named paper hereafter, when I propose to go into detailed particulars of the several gold localities. It is well, however, to give here the following extract therefrom:

I confine my observations in this paper to an area of about 20 square miles, situated north of the turnpike road leading from Dolgelly to Barmouth, county Merioneth. Prof. Ramsay has so ably described the geology of this district, in a communication to the Geological Society of London, 1854 ("On the Geology of the Gold-bearing Districts of Merionethshire") that I shall in this place merely give the geology of the district in outline for the information of those who may not have perused the communication referred to. The Dolgelly district is bounded, or nearly so, by the picturesque and wild River Mawddach, the great Llawnlech or Merioneth antennal range, and the little River Camlan, to which may be added a continuation of about three miles further north-east, at the junction of the Cambrian Sandstones and the Lower Silurian Lingula flags of the Geological Survey, and included in the Survey Maps 75 S.E. and 59 N.E. In this district are found the Cambrian, overlaid by the Lower Silurian Lingulae. The Cambrian rocks are coarse greenish-grey grits. The Lingula flags are arenaceous slaty beds, interstratified with courses of sandstone. Calcareous and greenstone dykes frequently penetrate both the Cambrian and Silurian rocks. In the latter the direction of the dykes is generally parallel with the lines of bedding; in the former, if any particular order obtains, their general direction is rather across the strike. The metalliferous products are chiefly argilliferous galena, copper pyrites, blende, manganese, and mundic, most of which are frequently found associated with native gold.

According to Sir Roderick Murchison, "The most usual position of gold is in quartz veins, which traverse altered paleozoic slates, frequently near their junction with eruptive rocks, whether of igneous or aqueous origin." The stratified rocks of the highest antiquity, such as the oldest gneiss, or quartz rocks, have seldom borne gold, but the sedimentary accumulations which followed, or the Silurian, Devonian, and Carboniferous (particularly the first of these three) have been the deposits, which, in the tracts where they have undergone a metamorphosis or change of structure, by the influence of igneous agency, or other causes, have been the chief sources whence gold has been derived.—*Siluria*.

I recommend your readers to peruse at length the monograph of Prof. Ramsay, last referred to, and to study diligently the Survey Maps, 75 S.E. and 59 N.E.

In the "Memoirs of the Geological Survey of Great Britain, and of the Museum of Practical Geology—the Geology of North Wales," 1865, by the distinguished Director-General of the Survey, at p. 44, will be found the following observations touching the "Talcos and Copper and Gold-bearing Rocks of the River Mawddach":—

Between Rhobell-fawr and the Mawddach there is a stream called Afon Wen, not named in the map. On its western bank are certain highly talcose rocks, which lie between the river and the greenstone, and crossing the stream near Ffridd-y-groes, pass southwards through the wood, across another unnamed brook a little below a picturesque bridge that lies about ¾ mile west of Llanfachreth. From thence, gradually becoming less talcose, the beds strike towards Moel Cynwch, and losing their peculiarities pass by degrees into the ordinary Lingula flags of the district. On the north they are cut by an east and west fault, at what may be called the south-west angle of Moel-Hafod-Wren, above Buarth, where highly altered Lingula flags abut against them, dotted with spots of greenstone, which are, perhaps, connected with a closely underlying igneous mass.

In the manner shown in the 6-in. horizontal section, sheet 37, line 2, and in diagram, Fig. 10, p. 42. On the east the talcose beds are also partly faulted and partly overlaid by Lingula slate, against which the massive greenstone of Rhobell-fawr abuts. The talcose rock itself is one of those problematical masses which it is impossible accurately to define, partly because of its variable character, and partly from the difficulty of accounting for its origin. Where talc is most developed it necessarily possesses a flaky texture and a soapy feel, but these characteristics often rapidly change within an area of a few yards; it either assumes an ordinary slaty structure, or, on the other hand, it passes into a hard felspathic-looking rock, which in some hand specimens it is impossible to distinguish from certain of the true felspathic traps, and in others from the adjoining greenstones of Penrhos. Even here, however, from the presence of much talc, it is apt to have a flaky aspect, which generally becomes more apparent the more the rock is decomposed. It then, at the surface and in lodes, decomposes into a kind of talcose unctuous clay; probably it may be a metamorphosed rock, perhaps, originally ashy, especially since near Festiniog other beds, near it in structure, though higher in the series, pass in the line of strike into felspathic ashes.

It is in the heart of the talcose schist, of diagram No. 10, that the gold-bearing lode at Dol-y-frwynog Mines, cutting across the strike of the beds in a W.N.W. direction, in the low ground south of Moel-Hafod-Wren on the east watershed. After referring to the gold at Cwmhesian, Gwynfryndd, and Clogau, the professor adds:—

Gold has also been found in a lode in the Cambrian rocks a little further north, and at Cae-Gwernog, Berth-lywd, the Prince of Wales Mine, and West Vigra. Gold has also been got to the extent of

faults, gave me a great deal of bother, and cost [me a good deal of money].

I wanted to arrive at a knowledge of the general direction of the principal faults, and their relation to each other, so that when any favourable indications were discovered, analogous to productive conditions in other localities, the shortest and least expensive mode of reaching them might be determined. (I had both gold and silver spurs to quicken my industry, for I had found myself two lumps of mineral, one containing 5 per cent. of its weight in gold, and the other 9 per cent. of silver.)

In my simplicity, I did not think the paradox ought to be an overwhelming or an annihilating intrusion. So I took counsel with gentlemen of the highest repute as geologists and miners. What some of them said at the time shall be given later on. The desiderated metalliferous deposits were sought by nearly all to be abundant; and more or less clearly they hinted at the faulty condition of the strata; but no two coincided in opinion as to the precise nature of the explorations that should be made.

The wealth was in the faults. What was to be done? It occurred to me to try and find out who was the most notorious *fault-finder*. It is no ill compliment if I say that many intelligent fingers pointed to the late Mr. J. W. Salter, A.L.S., F.G.S., &c., the eminent palaeontologist to the very Geological Survey itself.

I acted at once on this thought, and arrived with Mr. Salter to pass a couple of months in my Eldorado of a valley for the moderate sum of 50 guineas, which I paid him. I went carefully over the ground, and pointed out to him the principal peculiarities of the locality, and placed in his hands all my maps and memoranda. These details were afterwards supplemented on the spot by Mr. Ezekiel Williamson, an intelligent young miner, in whose untiring application to the subject I had perfect confidence.

I requested Mr. Salter to take at first a wide field of observation, and to apply the knowledge he would acquire to the Cwmhesian locality especially, and to go ahead at finding all the faults and down-thrusts he possibly could. Mr. Salter devoted quite two months of downright hard work to the subject on the ground, in honest fulfilment of his arduous task. This extremely interesting and important report I propose to place before your readers in *extenso*.

London, Sept. 7. T. A. READWIN, F.G.S.

(To be continued in next week's Journal.)

MINING IN WALES.

SIR.—In looking over the wide-spread *Mining Journal* and various mining circulars, &c., often sent to me, I find that for some time past there has been a very great depression upon mining in general. Many might ask the reason of such, and why mining has become all at once in such a state of poverty, and almost cast aside. There are many reasons, one of which, I think, is parties who have been and still are trying to make both ends meet are working away the ground that may partly pay for itself, and leaving the most valuable part of the ground unexplored because at the moment no ore is to be seen. I remember an old friend of mine in Treiddol who first took up the Goginan Mines after being abandoned by the Romans, and spent all his money. He sold a cow to keep it going, but like many other unfortunate people, he sold another cow, but to no good. At last he determined to hazard another cow, but, poor fellow, for the sake of his wife and numerous family, he kept the remaining herd from the hands of miners, to his sorrow. In a short time others took up the old mine, and by continuing the work he began in about 3 ft. or 4 ft. came to all the great riches that Goginan has produced. So much for perseverance, and in trying a little further, and a little more of the needful either in money or in kind. For the six years I worked in the above mine under the management of my late father, and other agents still living, the profits I believe to the then shareholders for the time mentioned were about 9000/- a-year, or, for the six years 54,000/-; so had my old friend sold another cow or bull it would have been a good thing for himself and his family. Again, there is the Plynlimon Mine. From what I heard to-day they have met with a beautiful and rich lode in a deeper part of the mine than they ever saw before, and this only in sinking from the 24 fm. level. Had this not been found who knows but the property in a very short time would be food for auctioneers and others; and now too much praise and credit cannot be heaped on the heads of the discoverers.

Again, the Wye Valley Mine. Look at it; go and see for yourselves, credulous readers. There ore may be seen like coal. The first time I passed this mine I found it idle. Some one or more could not afford a cow or ox. It is now gone under the management of practical mining agents, who in the days of my pushing on in trying to follow as far as I could the steps of a practical man, as my father was. I say the Wye Valley points out with a finger of hope to all mining companies as near as can be understood. Press on, and be not afraid. You shall by-and-bye, neighbour, be rewarded, as we are at the present time, under the management of practical mining men, and with no stint as to capital. Go on, and prosper. South Plynlimon Mine, which lies immediately to the south of the Plynlimon, spoken of above, about a half-mile, and parallel mining lodes to the above mine, and about the same distance south of the Great West Van Mine, running as it were quite between the two mines, has been for a long time knacked, perhaps for the want of an extra cow. The mine is under 50 fms. from surface—somewhere about 48 fms.—a regular mass of sulphur, and boiling with water. I always spoke of this mine as a good and worthy trial. I believe if a cross-cut had been sent out north of the present workings about 10 or 12 fms., or perhaps less, the best part of the property would have been discovered, and would, doubtless, be working to this day, but now the things are all drawn away, the beautiful office and other buildings have become a home for shepherds and their companions, and grass again growing over the places once appointed to be their dressing-floors and other buildings. Alas! for that confidence that all parties should put in their mining agents, instead of the parties called—"what you like." And this brings me on to the Great West Van, the West Esqair Lle, and other mines, and their management, which I leave until my next epistle, which shall not be long.

SAMPSON TREVETHAN,

Ponterwyd, Aberystwith, Sept. 8. Consulting Mining Engineer.

THE DIVINING ROD.

SIR.—If "N. B." cannot understand what I have written in my letters on this subject, neither will he "though one rose from the dead." His letter this week seems to contain less matter than even his former ones, and they were sufficiently void. He says his object was to expose some of my unwarrantable and prejudiced statements, and this object he has accomplished! Whereas, in truth, he has not even mentioned one unwarrantable or prejudiced statement of mine, neither can he, for I can substantiate everything I have written on the matter.

As to his personal attack on me, it is no more than may be expected from one who has not much in him, and puts one in mind of the lawyer when he had no case. "N. B." fails to see this, and fails to see that, but what have I to do with "N. B.'s" failings? If he does not understand a sentence when it is written in the plain English language, he had better read it again and again, until he does understand it. "N. B." has not tried to accomplish the task I set before him last week—to explain to us how, in that statement of his own, that "there are two kinds of reasoning; one proves a false and erroneous assumption to be true," he can show us that an assumption can be *proved* true, and yet be false and erroneous at the same time. He may twist it now into something else, as he is trying to do, but the above extract gave his exact words; and if he means something else he ought to have written what he did mean. But while "N. B." commences on the dowsing rod, he seems fond of hopping off to another twig. At first he assumed that I would have been pleased to have been placed on the back of a spiritualist, while himself bestrode the broomstick so closely allied to witchcraft. This, however, having proved a failure, he has got on to a "magical go-cart, running on three ivory wheels, with a pencil affixed." Would it not be desirable that he remained there, instead of occupying your pages to no purpose?

Mr. Spargo's attempt to be witty reminds one of an elephant trying to walk a tight rope; and perhaps he may allow me to suggest the

dowsing rod as a balance pole. As to his putting down this, or anything else, by ridicule, it will take a long time to do that. Mr. Spurgeon, whom he affects to imitate in this respect, may tell him how long men have tried to put down the religion he teaches by ridicule. Does he think they have effected much in that way, or that it will ever be accomplished? I have heard men express belief in the dowsing rod, who are as jealous for the honour of the county as Mr. Spargo can be, and who, although Mr. Spargo's ability is not to be despised, have achieved as much to support and uphold that honour. I may also venture to express an opinion that the course Mr. Symons proposes to adopt may be regarded as the most likely to lead to a practical solution. What reply, short of negative evidence arising from an extended and systematical course of practical experiment, can be of any possible use, brought against such evidence as is supplied this week by your correspondent "Scrutator"? The dowsing rod has been ridiculed for ages, and is still believed in; for some reasons certainly, and it might be found worth while to enquire into them. — W. TREGAY.

THE DIVINING ROD.

SIR.—Seeing an almost endless correspondence in the Journal on this subject, I wish before it closes to give my experience regarding it. I have tried it for the last 30 years, successfully, in the finding of lodes in every instance. It acts more powerfully on veins containing a large proportion of quartz than any others, and the more powerful or the larger the lode, with quartz or spar well intermixed throughout, the more thoroughly will the rod act. In tracing the Frongoch lode, which is certainly as fine a vein as there is in Cardiganshire, I found it two miles eastward by the first coastanean pit I put down. I give this as one instance, but the Goginan vein is almost as powerful, and I might name 20 others in this county. I find it a great assistance in the "throw or heave of veins." I have never missed in being guided by it. I, therefore, think, if on this account only, every practical mine agent should try to use it. I am persuaded that it will not act so powerful in the hands of some as it will in the hands of others; and, therefore, the party using it must have something to do in the rod's influence and bending. The Dolgelly district, where there are very large veins of almost pure quartz, is the best district for a doubtful customer. I have tried the rod there on several veins, and found it utterly impossible to keep it from bending, and indicating the presence of a lode. I have also known the rod to be successfully used in British North America, where it was tried, and indicated water, before the buildings intended were proceeded with. I believe that in very early times other things were observed and adopted for the finding of lodes, such as "ushing," by damming up large quantities of water on the tops of mountains and hills, and then letting it flow over the surface in one particular channel until all the alluvial soil was removed, and the rock laid bare to the eye. Also by vapours arising over the veins, which may be continually seen in every metalliferous district, and of which we hear so much about as the will-o'-the-wisp, the corpse candle, &c.

I am not going to endeavour to go into what causes the rod to incline to veins, as I believe that, as well as the reading of the dial, or shifting of the earth sometimes in a more northerly and sometimes in a more southerly direction, are matters that will long remain a perfect mystery, and I doubt much if ever they will be accounted for. I will now conclude by inviting any unbeliever to make a trial of the rod in the district I have named, and if he continues in unbelief I can only say with Hudibras—

"Of all the blind that blind there be,
There's none so blind as those that will not see."

Aberystwith, Sept. 6.

ABSAKOM FRANCIS.

THE DIVINING ROD.

SIR.—A few weeks ago, being at Redruth, I was invited to join a small company of gentlemen, after their dinner, at Tabbs's Hotel. Amongst a variety of topics which came on the "carpet" was that of "dowsing," on which so much has been written of late in your valuable Journal. These gentlemen, like your correspondents, were divided in their opinions, some being *pro* and some being *con* as to the utility of the rod in searching for the lodes. Several instances were given and alleged as proof of its efficacy. One was in finding metal—*i.e.*, a watch placed under a hat in the absence of the "dowser," so that he could not have known under which hat it was placed before the rod dropped over it. This was admitted at the time to be a proof of the rod's efficacy so far as the experiment went. Another instance was the discovery of a gossan lode, which was found 5 fathoms deep precisely under the point which the rod indicated. They sunk and found it in consequence of the rod's indication. Although these two instances were given by credible gentlemen who personally knew the facts many will require further proofs to remove their incredulity, and such proofs if possible I hope to be able to supply after the lapse of a few weeks. R. SYMONS.

Sept. 6.

THE DIVINING OR DOWSING ROD.

SIR.—I wish to put an end to all this controversy about the dowsing or divining rod. Some years back I was challenged as regards the efficacy of this rod. I was blindfolded at St. Ives, in Cornwall, in the presence of two mining captains of the neighbourhood, who led me, and I was desired to walk on the main road from St. Ives to Liskeard. It was understood that when I gave the signal of a lode a stone was to be placed on the spot, and the mines open between St. Ives and Liskeard were visible on the internal lands, and would surely prove the accuracy of my dowsing rod. I proceeded blindfolded the whole of the way, and I beg to say all admitted that I had discovered the situation of every known lode in the district, but there were others that my rod yielded to that were never proved. The cause of the action of this rod I cannot explain. I am quiet satisfied that I am enabled through this rod to discover any lode in any district in the world, but if I am asked to say where the deposit of copper, tin, or lead is I cannot do that. It is quite a matter of discovery in development. If any of your readers wish to have proof, pay my expenses, and I will not only discover lodes, but teach them how to do it as well as myself. Strange to say, the rod must be hazel.

Jersey, Sept. 4.

force how is it, I ask, that "Scrutator's" experiments, "and others as well," were so singularly correct? I leave this for "N. B." to explain, particularly as he states that he knows as much of the secrets of Nature as "Fair Play" (who has not yet said that he knew anything at all), or anyone else.

FAIR PLAY.

THE OCCULT SCIENCES—DOWSERS AND DOWSING.

SIR.—I had intended to postpone any further communication till I had replied to the correspondence which my letter was likely to elicit, but I cannot refrain from expressing the astonishment I feel at the illogical denunciations of dowsers and dowsing indulged in by Mr. Spargo, and the deplorable ignorance of common things displayed by "N. B." who remembers to have heard of curious experiments with a little flat board on wheels, called a planchette—he forgets its name, so I may as well supply it, and beg him to be less rash in his statements of fictions, miscalculated facts. To deal with his fictions would take up as much of your space as I ventured to occupy last week, without attending to Mr. Spargo's, but as the subjects introduced are of general interest, and no little importance, as, indeed, any subject to which the leading journal devotes a whole page of its costly columns must admittedly be—and most people heard of the elaborate *resume* of the facts and phenomena of pneumatology which appeared in the *Times* last January year—I think I may venture to ask you to enlighten the ignorance of so many of your correspondents, who illustrate the old proverb that "fools rush in where angels fear to tread." Some, however, hug their own delusions on the somewhat questionable theory that "ignorance is bliss," and consequently that "it is folly to be wise." I never could see the practical value of the latter proverb, I think it is always better to open one's eyes to facts however disagreeable they may be, however dangerous to one's cherished fictions and laboured theories. I think it is better to face a danger than to sneak out of it. I feel so little in love with any opinion of my own that I have no one that I would not thankfully surrender to-morrow if anyone could show me that it was unsound or founded on a fallacy. I think the worship of consistency, as it is generally understood, a terrible blunder. People hug their own opinions for consistency's sake, forgetting that those opinions were formed upon insufficient premises, and that if an additional number of facts had been furnished when the opinion was formed the result would have been in accordance with the sum of facts, and not with the fraction of testimony which misled them.

It is as absurd to persist in a mistake as it would be to stick to an assertion that there were only four oranges on a table when an extra dozen had been added to the original four by a flunkey in attendance without waiting for orders. Fools ignore the facts they object to; wise men accept all proven facts as indubitable, and do their best to arrive at a legitimate explanation of them. They never dream of fitting their facts to their theories, they try to fit their theories to their facts, and if their theories only explain a fraction of their facts they suspend their judgment and wait till they can arrive at a theory which accounts for all the phenomena. It is ridiculous, indeed, for scoffers at the phenomena of pneumatology to quote in disproof of them the astute conjurers Maskelyne and Cooke, who trade upon the orthodox prejudices of the priest-ridden majority, upon the same principle on which the worthy quack pretended to act when he was challenged by an orthodox allopath to account for the success of his illegitimate practice. "How is it," said the allopath, "that my clients fall off and yours increase?" Because, said the quack, "fools are the majority, and you leave them to me." There was more wit than wisdom in the assertion, for the reverse is nearer the truth—the fools go to the allopath and the wise to the homeopath, quack as he is in the eyes of his orthodox rival, for the majority are not always so blind as those who represent them, and who often trade upon the ignorance and prejudices of their immediate neighbours, and talk down to their level, till their own eyes are blinded by prejudice and superstition, which are nearly as contagious as zymotic diseases.

To return to "N. B." The French would say "Let us return to our mutton," and, by your leave, I mean to make mince mutton of him before I leave him. No doubt Mr. Tregay will be able to defend himself, and quote Virgil with effect, for his knowledge of that learned poet seemed to be very satisfactory, and I am no novice in classics, inasmuch as the Spectator once paid my translation of the Eclogues the high compliment of comparing it to Conington's *Oeneid*, and I am sorry I did not follow it up by a translation of the Georgics, which contain so many allusions to occult lore, but that is a matter which demands attention, and may possibly receive it. I doubt whether "N. B." would be qualified to annotate the text, and still more, whether his ideas on the philosophy of the growth of plants would be worth discussion. No chemist has yet explained the philosophy of chemical combination, much less the reason why some substances show affinity for each other, and others none. The fact is that chemists and philosophers for the most part ignore occult philosophy and the spiritual element in nature. They are practical naturalists, and till they take mineral, vegetable, and animal magnetism into account far more than at present they are not likely to solve the problems over which they are puzzling their brains. Huxley and Tyndall are able men, but they have fallen into a frying-pan from which they are only likely to escape into the fire. When a man like Huxley says in one breath "If these things be true there is an end to my philosophy," and in another, "I have no time to attend to these things, I take no interest in them," that man can no longer set up to be a truth-seeker or a safe guide. He is a blind leader of the blind, and certain to fall into a ditch, where his reputation will be deeply stained. He is certain to be distanced in the race by more candid and less prejudiced investigators.

I have already referred to Maskelyne and Cooke's pretended *exposé* of the phenomena of Spiritualism. Maskelyne and Cooke have been themselves exposed by Dr. Sexton at the Crystal Palace and elsewhere, and his interesting pamphlet explaining their conjuring tricks has been widely circulated by the publisher of the journal which I referred to last week as one of the organs of the movement which "N. B." pronounces extinct. Does he deem that the existence of paste diamonds, which none but trained eyes can distinguish from real gems, militates against the existence of real gems, or that any imitation of a genuine phenomenon is any proof of the non-existence of the phenomenon imitated? If so, I admire his audacity in intruding his folly on the columns of a public paper which is conducted with common sense, and which, therefore, allows noodles to demolish themselves in public in order that they may be less able to do mischief in private. As I have before hinted, his unadorned facts are unadulterated fallacies. His conclusions are no better. He has arrived at the conclusion that the motion of the dowsing rod, as also the movements of the planchette, are caused by *muscular force*. How, then, does it happen that "muscular force" is cognisant of events happening in distant localities at the time that the question is put to the inert machine? How is it that *muscular force* is cognisant of subterranean treasures unknown to the dower who holds the rod? I have a rod in pickle for "N. B." The idea that *muscular force* is able to answer questions correctly when the information asked for is wholly unknown to the individual whose *muscular force* is exerted has indeed been exploded long ago, but the ready sale of planchettes proves that their use has not been exploded. It is only a week or two ago that I met, at a seance, one of the Princes Borghese and two Italian counts who were travelling with him, who were staying at Claridge's Hotel, and constantly eliciting from their planchettes information of what was occurring at their Italian homes; and, as the subject was new to them, for it had been introduced to their notice by the friend at whose house I made their acquaintance, they had written home to enquire into the truth of the information so conveyed to them, and they assured me that they found it to be literally true, and that they were not troubled, as many people are, with untruthful messages. I know many people who have proved the efficacy of the planchette, some to whom it has truly prophesied coming events; but it is really nothing more than a Leyden jar or reservoir of animal magnetism, which enables invisible intelligences to communicate with those who have not sufficient magnetic power to receive communications from the unseen without such adventitious aid. It is a means of developing the latent faculty of writing mediumship which enables Anglo-Saxons of the nineteenth century to do what the Hebrew prophets of the Biblical period did in Palestine.

tine—to become the secretaries and write at the dictation of spirits more or less wise or fallible, as the case may be. As are men, so are spirits—some wise, some foolish; some highly educated, with all their mental powers developed and cultivated; some as undeveloped and uncultivated when they quit the earth as they were when first incarnated. The orthodox majority, under the influence of priesthood, believe in ancient spiritualism and the intervention of materialised spirits; they believe that spirit messengers sat down to dinner with Abraham and feasted on his veal, and finally evaporated with it, and they believe in all the other marvellous phenomena recorded by Jewish scribes to have taken place 3000 years ago. They believe that David drew the plans of the Temple at Jerusalem by spirit influence, for so it is recorded, yet ancient and modern spiritualism, as a Fellow of the Royal Society lately observed to me, must stand or fall together. The Duke of Argyll, in his "Reign of Law," conclusively demonstrated the fact.

"N. B." prides himself on his orthodoxy. He is one of the priest-ridden community; he leaves the things of heaven to the parson, and yet he professes to know as much of the secrets of Nature as anyone. Truly, I doubt if he knows one of the secrets of the invisible world, and, if Nature means anything, it means the invisible world as well as the visible. I define it to be the universe of being, visible and invisible, and if he can give me a better definition I will add it to the collection I hope ere long to print in a dictionary of definitions, which is so greatly needed to correct the loose phraseology of the uneducated classes, who use ambiguous terms in the most illogical manner, to the utter confusion of all common sense and common experience, which is the foundation of common sense. My neighbour boasts of his common sense as founded on his practical experience, and so do I, but we have each our own circles in which we revolve, and mine may be a very different sphere from his. Is he to ignore my experience because it is not identical with his own? It may cover more ground, and if so it is *pro tanto* more valuable. Should it happen to cover less I should not dream of ignoring his if his were to become accessible to me. I was not aware that Mr. Welton had published the translation of "Jacob's Rod," which he once asked me to peruse and revise for him. I glanced at it, and thought it would be less trouble to re-translate the work, and I thought I knew of works far better worth the trouble, but I should be glad to know where to get the work, for I like to add every work I can find on this subject to my collection. Every little makes a mickle. Every bushel of chaff is apt to contain some grains of wheat, and where famine prevails it is well to scrutinise every source of supply. Many people throw away a book at once if they find it contains any follies or fallacies which are repugnant to them, and lose an immense deal by not taking the trouble to sift the wheat from the chaff. Mr. Welton has much experience of the occult philosophy, which is connected with the dowser's art, derived from the wonderful faculty which his wife possesses in an eminent degree—the faculty of clairvoyance and psychometry—and many physicians resort to her in secret to obtain her advice on the obscure ailments of their most troublesome cases, and one of them has published his experience of her powers in a pamphlet entitled "Medical Clairvoyance;" and as he is a brave man he has put his own name to it, but suppressed hers; he calls her "Mrs. W." for clairvoyants were not protected by the law of the land in the public exercise of their gifts when he published his little work. The influence of ecclesiasticism has been powerful to influence the Legislature in many ways most prejudicially; and though mediums in these days are no longer liable to be burnt as witches, as were the mediums of the last century, the intolerant legislation which sanctioned that fearful atrocity has left its traces in our statute book. Astrology still subjects its professor to penalties if he practises it for gain in England, although in our Indian Empire every rajah still has his Court astrologer, as had our great reformer, Henry VIII., and his predecessors, and they never act in matters of importance without consulting the planets. I could tell you tales on the authority of a distinguished Indian civilian which justify their wisdom, and bear witness to the folly of our bigoted legislation, which still proscribes so many useful industries in deference to antiquated superstition.

I said I should find it difficult to find room for an *exposé* of Mr. Spargo's preposterous allegations, but I have time to attend to him if you have space to devote to him; and as he is a typical representative of a large class who greatly need enlightenment, I think you will forgive me for dealing with his letter in a somewhat detailed fashion! If a critic omits to notice a paragraph he is often accused of evasion. My letter, and Mr. Symons, printed immediately above his own, contains a very sufficient answer to his preliminary challenge, but I could give him a list of a large number of successful mines in France, all tabulated in an old work on my shelves, published two centuries ago, which were discovered by an enthusiastic French count who delighted in dowsing, and seems to have devoted himself to it as a matter of business. My own mine manager, whom I picked out of a mine in which he was only a working man for his dowsing faculties, and whom I have retained in my service ever since for his sterling honesty and fidelity and many other qualifications, has an experience of 30 years and upwards to guide him, and he declares that his rod has never yet deceived him, although he has had to demolish the highly-paid opinions and confident assertions of many professional mining engineers and viewers, and to such an extent is it possible to develop, and cultivate the dowsing faculty that when the agent whose report to me I criticised so severely appealed to a confidential employé at one of the Cumberland hematite pits which he took me to see as to whether he had ever come across the divining rod, or heard of its being of practical use, the miner appealed to answered that "he had known a man who could find a penny in a plough-field by its agency," and after that I never heard my employé open his mouth on the subject. He had his quietus from an umpire of his own choosing.

Why, says Mr. Spargo, is not the untried mineral ground of the British Isles opened up? I will tell him. It is because capitalists have been scared by the frightful frauds which have been committed by mining agents, mining captains, and mining companies. It is because highly-paid mining engineers do not know their business, and mislead people by erroneous opinions. It is because the occult sciences, by which alone it is easy to fathom Nature's secrets, are proscribed by ecclesiastics and neglected by practical men, who dare not brave the prejudices of their neighbours, if they do not share them, as the majority do, because they have imbibed superstition with their mother's milk, and never learnt to open their eyes. It is because speculators in mines seek to draw illicit gains from the pockets of the unwary rather than legitimate earnings from the bowels of the earth. It is because it is easier to make money by operations for the rise and fall of the market than it is by operations with pick and spade. It is because there is so much capital wasted in digging through barren rock and dead ground instead of being spent in exploring lodes and deposits found by skill, and mapped accurately beforehand by plodding industry and practical intelligence, assisted by the dowsing rod. It is because the square men have been put into the round holes, and *vice versa*. It is because such men as my manager have been left to dig and delve as common miners, while their inferiors, incompetent in every way, have been promoted to posts of responsibility and honour for their base subservience to dishonest people, who go bankrupt over and over again, and yet find means to set traps for the unwary in advertising circulars. These are the reasons which have caused capital to fight shy of mining; these are among the reasons which have induced me to indite this letter and to contemplate the series of letters by which, with your leave, Sir, I will follow it up, for it is time to cleanse the Augean stables, and introduce wholesome reforms into the mining world. There are many Augean stables awaiting a Hercules in this country, and the Press is the Hercules which alone has the power to do the colossal work. One man is powerless by himself, but by the aid of the Press he may become a power endowed, like Briareus, with a hundred hands. If an allegory were to be formed to typify the power of the Press now the monster would have a myriad hands, and more, for truth, once disseminated, has a tendency to propagate itself, and the enormous circulation of popular periodicals is not measured by the number of copies published, but by the number of readers who peruse them—probably some ten times the nominal circulation.

But this is not germane to our text, which is Mr. Spargo's effusion. He deals in denunciations, like all superficial critics, who mistake assertion for proof. The Rev. Mr. Spurgeon may be a very good authority among the members of Methodist conventicles, but no ridicule of his will put down facts, however unpalatable they may be to his confraternity. It is a great mistake to suppose that the priests who ride roughshod over Anglo-Saxons of the Victorian era are confined to the orthodox persuasion. All ministers of religion, falsely so called, are tarred with the same brush, and belong to the same category. They are strutting jackdaws in peacock plumes, pretending to supernatural gifts which they do not possess, and claiming an authority as teachers for which they are not qualified by education or acquirements, if the value of education is to be tested by the truth of the theologies taught. All religions are systems of theology more or less false and more or less true—that is, they are superstructures of error built upon a substratum of truth, but the truth is very often almost entirely buried in a mass of rubbish. Those who think otherwise will do well to read "Speech in Season," the recent volume published by the Rev. H. R. Hawes, the most popular preacher in the metropolis, and certainly not the least honest and outspoken. He does not agree with Mr. Spurgeon nor with Mr. Spargo. And the Cornish worthy is not more happy in his appeal to a foolish speech of the late Sir Henry Holland, who not having followed the bright example of Drs. Ashburner and Elliotson, son, who gave up a lucrative practice of orthodox quackery to utilise the resources of animal magnetism and clairvoyance, was as unqualified to express an opinion on a subject he had never investigated as ever the cobbler was who gave rise to the proverb *Ne sutor ultra Crepidam*. He should have stuck to his last. *Nemo mortalium omnibus horis sapit*, but he is no longer alive to be criticised, so I will simply produce against him higher authorities, and none so high as my relative, the late Archbishop Whately, whose Commentary on Bacon is deemed as valuable as the disquisitions of that wonderful sage himself, and who followed in his footsteps in more ways than one. Bacon was an astrologer and an alchemist. The Archbishop of Dublin was the president of the Mesmeric Hospital in London and the Mesmeric Institute in Dublin, and before his death a convert to the modern spiritualism which is so scoffed at by the Spargos and the Spurgeons.

But your correspondents asks one sensible question—What is the rationale of the divining rod? Like him who propounded the vexed question, What is truth? he does not wait for an answer, or desire one; he prefers to blink the question; I prefer to answer it, and seek for an answer till I find a satisfactory one which will cover the ground. I answered it in my last letter, and I may yet be able to adduce more convincing proof of the soundness of my answer from practical experiments conducted upon proven lodes of various minerals. I object to shirking; I learnt to hate it at Rugby, and I have never renounced my objection to it. I think I answered the question, What is truth? pretty exhaustively in a work I wrote and called "Hymns of Modern Man;" and I will conclude my long letter with a quotation from it, because it is so applicable to your correspondents. Truth is the sole object of a logician's quest, it is the sole prize of the philosopher's love, and it is the only good worth aiming at in mineralogy and mining; and so I may well say with Southey if, indeed, Planchette rightly attributes these rhymes to that poet—

"Truth is floating on the river, truth is floating on the lake,
But the mists of error veil it—it is the fog of morning break,
When the daylight streams from heaven, when the sun puts forth his might,
Sent upon a roaming mission, to dispense the shades of night."

"For the truth and the light go together,
They never are happy apart,
They are verily birds of one feather,
One spirit, one soul, and one heart.
They are twins like the lightning and thunder,
Born twins like the eye and the ear,
They are twins that none dare put asunder—
Both even and equally dear.
For the light was the gracious Creator's
First boon to the world that was blind,
It was light say the ancient narrators,
His latest best boon to the mind;
So when youth and its Ulians have flitted,
The joy that will rule us no ruth,
Is of all joys to mortals permitted,
The wooling and winning of Truth."

The first rhymes were quoted to me as Southey's, by Planchette; the two stanzas are the last words of my own answer to the vexed question, and I am still seeking a better one. SCRUTATOR.

Sept. 8.

MINING INVESTMENT, AND MINING SPECULATION.

SIR.—It has been no unusual thing in the experience of the readers of the *Mining Journal* to see a mine share suddenly rise in the market from a few pence to as many pounds. Devon Consols rose from 1/- per share to 800/- a year. East Caradons were bought in the market at 1s. 6d. per share shortly before they rose to 50/- each. Numbers of instances of the same kind have constantly been referred to as showing the great results as well as the fascinations attending mining pursuits, but for the most part, unfortunately, only as baits to foist speculations upon the public at monstrous premiums, which went into the pockets of lessees and promoters. Those who made large fortunes by investing in such mines as Tresavean, Buller, East Rose, Bassett, South Caradon, and others did so by going into them at cost price, and by sticking to them, relying on certain indications which they knew seldom failed.

In speculations, money is made by understanding and noting these indications in progressive mines, by knowing when certain objects sought for are likely to come off, and then by buying shares when very low in price, and probably at a heavy discount. It must not be supposed that fortunes are always made like a flash of lightning. Tresavean and others named were a heavy drag upon the early shareholders in them for a time, and excited as much difference of opinion and discussion as mines do in the present day.

Long as it seems ago, I watched the successful career of each of the mines I have named. I saw Buller shares rise from a few pounds to 1200/- each. I knew a Governor of the Bank of England, who took a lot of East Rose shares for a bad debt at 10/- each; he threw them on one side as worthless, and swore heartily at the calls made upon him. I afterwards saw him sell them (in 1844, I think) at 1500/- each! Capt. Thomas Teague, who discovered Tresavean, in which shares rose from 10/- to 2000/-, made a large fortune, and many of his London friends made their 10,000/- and 20,000/- each.

In the days of Tresavean, nearly forty years ago, it was always said that there was no copper, and consequently it was useless mining for it in the eastern district, and it was while this prejudice existed that James Clymo came to London from Liskeard with stones of ore he had taken from a lode in St. Cleer; he was very sanguine about the lode he had found, and as I handled the specimens he brought with him I thought I had never seen finer, but prejudice kept alive by great practical authorities, was too strong for him, and he could not get anyone to join him in the company he wanted to form. Going home in the mail he offered a gentleman of Albermarle-street, who was a shareholder in Tresavean, half the discovery, that is 32-64th shares, at 5/- each, which was refused. Clymo and his brother Peter, and Thos. Kittow then worked the mine as South Caradon, and the shares refused at 5/- soon became worth 2000/- each. The mine is still paying dividends. Some years after this Devon Great Consols flashed upon the scene, and the *East* became far richer for copper than the *West*. But prejudice dies hard, and it still flourishes in mining matters, where everyone seems to have his favourite district and his pet theory. The old motto was—"Where it is, there it is," and prejudice added "it ain't in the *East*."

And now at the present day, if we may not ask the question, are there not as good fish in the sea as ever came out of it, may we not fairly enquire if there is not plenty of good and promising ground now being explored in Cornwall and elsewhere out of which a few more prizes may be obtained? They are, all will admit, very much needed.

During the many months of depression that mining has passed through I have watched somewhat carefully the career and prospects of a number of mines, and now that I think things are taking a turn I will, with your permission, send you a few remarks upon them from time to time.

As you have on more than one occasion of late referred to the fact that a "division of risks ensures success in the aggregate," I venture to call your attention to the exceptional advantages now offering for such a selection, both as regard low prices and good prospects. I will this week name nine progressive mines, every one of which ought in a few months to be selling at higher prices than they can now be bought for:—1, Marke Valley; 2, Wheal Crebor; 3, West Tankerville; 4, Parrys Mountain; 5, Relistian Consols; 6, Penstruthal; 7, East Caradon; 8, Cathedral; 9, West Frances.

The first has been a well-known dividend mine, and may soon become one again. The second, Wheal Crebor, has a good cash balance in hand, worked very cheaply by water-power, and has good prospects. The great points are the 108, 72, and 120 ends, either of which with a course of ore would double the returns. West Tankerville were freely selling at 3/- 10s. when the mine was not looking so well as it does now. Parrys Mountain from first to last has paid upwards of five millions profit; the shares in the present company have fallen from 3/- 10s. to 14s., and the prospects are good. Want of ready money has been the chief drawback of late, but that is the 90, now approaching the lode towards the great open-cut. Relistian Consols has been brought out without any premium or promotion money whatever. Two years ago the mine was selling for 15,000/-, with prospects supposed to justify it; but, owing to the bankruptcy of the principal proprietors, the mine, machinery, &c., after an expenditure of 10,000/- at least, was bought in one lot, and the present company formed, with an ample working capital. There is no better speculation in Cornwall at the price, nor one likely to rise higher in proportion. The Messrs. Bolitho, bankers and smelters, of Penzance, the Messrs. Harvey, of Hayle, and other well-known Cornishmen have gone into it. East Caradon and West Frances have been very much depressed, but look well for a rise again. Penstruthal and Cathedral are near each other, in the rich Gwennap or Tresavean district, and have a Teague for manager, and both offer great advantages—the one for tin, the other for copper.

There are other mines that are well worth buying, in my humble judgment, and I may refer to them hereafter, but at present I confine myself to nine, all well known on the London market; and out of which any six may be selected for a small purchase in each, and if such a purchase does not realise a large profit before long, it will surprise—

AN OLD MINER.

CORNISH MINING.

SIR.—The gradual improvement in the price of metals has brought about the change so much desired in the great mining enterprise of the county. It is a change which cannot be hailed with too much thankfulness, for had the depression continued the result must inevitably have been disastrous. Deep tin-producing mines can now be wrought at a profit; it will also give an impetus to the working of mines in new ground, the development of which, when compared with the working expenses of deep mines, amounts to a mere trifling, whereas the chances of rich and lasting discoveries being made are greater. I have long since advocated the working of new ground, of which there yet remains such a fine field for the capitalist. In the Gwennap district (which has probably yielded more mineral worth than any other district in England) attention is being paid to this less hazardous mining speculation, and the result so far has been favourable, in some two or three instances valuable mines have been found. West Poldice, Killifret, and North Busy are progressing towards a dividend state, the former with an outlay of about 5000/-, is now selling in the market at about 30,000/-, the outlay required to bring them to their present position not being a tithe part of that required in the resuscitation of old worn-out deep mines, nor even a quarter part of what has been charged as promotion-money for some of the worthless trash which has been palmed off on the public. Let them, therefore, avoid mines requiring large capital, and invest in those being wrought in virgin ground, where the chances of success are infinitely greater, while the risk is correspondingly less, and the result being greater prosperity to Cornish mining, and better times for one and all.

St. Day, Cornwall, Sept. 8.

CHAS. BAWDEN.

DRAKE WALLS MINE.

SIR.—I have seen the letter in last week's Journal, signed "A Shareholder," who, I suppose, has had the same courtesy extended to him as all the other shareholders, by having the minutes of the several meetings sent him. If, after this, his ignorance is so great as his queries imply then he is deserving pity. But my impression is the writer is no shareholder, and that other motives prompted him in drawing the attention of the public to this particular mine. With regard to the question at issue, I understand the mine has nearly paid its costs for some months past, showing for a mine of such magnitude only a trifling loss; and, moreover, that the last month's sale of tin, which took place before the recent advances in price, actually left a small margin of profit. I leave your readers, therefore, to judge what the result would have been if the price of tin had kept to the figure it was at when the mine was re-started by the present company—about double the price made of their last month's parcel. I contend no man could be expected to fulfil promises made under such adverse circumstances as have befallen tin mining during the past few years. If Capt. Skewis and his friends have failed in their attempt to make this mine a profitable investment they themselves are the heaviest losers thereby, and I, for one, feel they are, to say the least, entitled to public sympathy, if nothing more. There is some consolation, too, in the fact that the employers and merchants of the district have benefited largely by the outlay of so many thousands of pounds as has been expended here.

Sept. 9.

JUSTICE.

WEST ESGAIR LLE MINE.

SIR.—Being in the neighbourhood of Aberystwith, and one who is much interested in practical mining, I am given to understand that the committee of this company has been fortunate in securing the services of Mr. John Davies, who is the present resident agent of the Bronfondy, and, without doubt, from this gentleman's long experience in mining some practical science will be brought to bear on this property, which may be highly interesting to the locality.

Aberystwith, Sept. 8.

[For remainder of Original Correspondence, see to-day's Journal.]

THE MINERAL RESOURCES OF THE SOUTH-WEST OF IRELAND—NO. XXI.

[FROM OUR SPECIAL CORRESPONDENT.]

CASTLETOWN, BEREHAVEN.—The Dursey Head divides Kenmare river, so-called, which is a noble bay, running inland some 40 miles, and at its head is the town of Kenmare, some miles from Bantry Bay. Bere Island forms an admirable breakwater for Castletown harbour, which is situated at the entrance (north side) to Bantry Bay, and in which the "Great Eastern" and the British Navy may ride in perfect security. Castletown is close to the harbour, and pleasantly situated, but its trade and business depend in a great measure on the Berehaven mines. Prof. Warington W. Smyth, of the Royal School of Mines, in his "Notes on the Berehaven Mines" makes the following remarks:—

"The range of mountains which carries the Berehaven Mines on its extreme western slopes is a continuation of the lofty and broken range which divides the bays of Bantry and Kenmare. It consists at this western extremity of the slate rocks (the killas of the miners), and of some interstratified more massive beds, all of them highly cleaved; the cleavage planes are almost vertical, and coursed east, 35° north. The dark blue varieties of the clay-slate are considered by the miners unfavourable to the production of copper ore, while the grey, and particularly the buff kinds, as in Cornwall and elsewhere, are held to be congenial. The Mountain Mine, an extraordinary thick course of white, hard, wild quartz, runs in a wavy east and west direction, with a northerly underlie, through a rough mass of sixty and grit rocks, at an elevation of between 400 and 500 ft. above the sea, for a length of above 100 fms. It is 50 to 60 ft. in width, but by no means attractive to the eye of the miner. At a greater depth the whole width of the lode, in despite of the unfavourable opinion which would have been passed on it at the surface by most miners, became impregnated with ore, and was in some parts worked to a mesh of 60 ft. wide."

This celebrated mine, under the management of Capts. Reed, sen. and jun., produced copper ore of the value of several millions sterling, and within the last few years it was sold to a company, it is said, for 95,000/- The new company will have to make large returns to repay the purchase money, and although the consulting manager is said to have effected a vast saving of expenditure by economising

the water pumped up by the engines, it does not appear that the shareholders have received any dividends from this and other improvements of a similar character. To the east of the Berehaven Mines the Sleive Miskish Mountain rises to a height of 1272 feet, and forms part of the great range of Caha and Glannerought, the southern boundary of Kerry. This great mountain range, extending from Berehaven Mines east to Glannerought, a distance of 40 miles, is as completely a *terra incognita* as the remotest corner of the Fiji Islands. It contains, however, many great lodes of quartz, &c., which, if explored, would probably prove as productive as similar formations in the Berehaven Mines, for it would be contrary to all experience to suppose or expect that all the minerals in this range of mountains are deposited in a "detached lump" in the Berehaven Mine. Prof. Warington Smyth truly describes the surface appearance of the lode in Berehaven Mine as an extraordinary thick course of white, hard, wild quartz, and by no means attractive to the eye of the miner. From Berehaven Mines to Glannerought, a distance of 40 miles, this great mineral range has never been explored, except in one hole, 4 ft. deep, rear Waterfall Cottage, where there is a large lode of quartz impregnated with copper ore.

WHY ARE THE METALLIC RESOURCES OF IRELAND NOT DEVELOPED?

We have published a long correspondence on the Metallic Resources of Ireland, and the question naturally arises, and which has often been put to us—Why are these resources not developed? If it be true that there is room for the capitalist and the practical miner to work these with good promise of success why do they not come forth, when by doing so they would enrich themselves, add to the wealth and power of the empire, and give employment to the better class of workmen among the inhabitants of Ireland?

Perhaps there are good reasons why this does not take place, but it is, all will admit, desirable that the subject should be thoroughly discussed, and especially in the most appropriate organ for doing so—the *Mining Journal*. It may be, and we fear it is so, that many will regard the position we take, or the facts we assume, as a *petitio precipiti*. But no man can be said to beg a question when he has first established the propositions on which it rests. Now, nothing was ever shown more clearly than that Ireland is a rich metalliferous country by the letters on the subject, the long series of which has appeared in the *Journal*.

Ireland is not gold producing, but she has been so, and may be so again. The geological formation of the county of Wicklow is favourable to the expectation of finding gold, and gold was obtained in considerable quantities towards the close of the last century, when the Government, as a matter of policy, put a stop to the work of the gold seekers. The Norman kings extracted a far higher tribute in the precious metals from Ireland than from England, because it was assumed that she was richer than this country in these products.

It is very remarkable that the father of the present Sir Charles Dilke asserted in one of his fine art, or antiquarian, lectures that more antique gold ornaments had been dug up in Ireland than in all the rest of Europe besides. And this has been abundantly proved by independent investigators since the assertion was made.

As to silver, there are, so far as known, no deposits of virgin silver in Ireland, but the silver-lead mines are richer in the precious metal than any in other portion of the British Isles.

Ireland is not stanniferous, although there are some misty traditions, as dark as a mud cabin filled with peat smoke, that the Phoenicians found it in Wicklow and in Kerry. That the enterprising Syrian and Sidonian were in the South of Ireland, at all events, is undisputed, and if there were tin they would have got at it. The late Capt. Matthew Francis, whom we often quote, because he was a genuine scientific miner, believed that there are tin deposits in Wicklow; but some English miners of high reputation who have investigated the metalliferous peculiarities of Ireland have declared to us that there is not an ounce of tin beneath her soil, or embosomed by her rocks. As far as we know, the geological phenomena presented are against the expectation than any of that metal will be found there.

Recent letters from the South-West of Ireland, published in the *Mining Journal*, leave no doubt of its cupreous wealth. Copper in all forms abounds, and nearer the surface than anywhere else in the British Isles.

Lead is stored by nature in the Comeras, the Galtes, at the foot of Croah Patrick, and to some extent in every one of the four provinces, probably more abundant in Munster and Connaught than in Leinster and Ulster; and it is affirmed by competent explorers that the lead deposits are rich, and easily accessible.

Ireland abounds in iron, especially adapted to make steel, and the ore is freer from impurities than the iron deposits of any portion of Europe. The iron mines of Antrim, on the extreme northern coast, near the Giant's Causeway, are held in great repute for the abundance and purity of their produce.

When Elizabeth ascended the throne of England Ireland was extensively covered with forests, and the timber was used to make charcoal to smelt the product of the numerous iron mines found so near the surface over a large area of the country. In the wars conducted by the Earl of Essex and others this timber was cut down, and the smelting operations ceased. The poet Spenser, who held high political authority in Ireland, sung of

"The flowing Bandon, crowned with many a wood."

We have ourselves travelled along its banks denuded of timber now, except a few sparse modern plantations, and all is silent in many parts of Ireland where the forges made the heavens lurid, and the cheerful ring of the hammer on the anvil made the hills resonant. It may be said by some readers of these remarks what a pity they had not coal! Paddy had then, and has now, as he would say himself, "lashings of coal;" it was beneath his feet wherever iron was to be found, but he would not use it. This is just the case with the Russians to-day; when the timber fails, which it is extensively doing, they will not dig out the coal, at all events except under the most forcible pressure. What the Russian iron is to day the iron of Ireland was 300 years ago—the best in the world. Paddy now often warms himself by fires of Irish coal, as some millions of tons of it are annually consumed in Ireland.

Why, then, in the name of common sense do not English capitalists and practical miners take some interest in our question? It is pleaded that the Irish are impracticable, but they do not prove to be so in England, Scotland, or America. They are acknowledged to be hard and persistent workers.

It is objected that their Saints' days are so numerous as to interrupt the progress of work; this certainly would be more the case there than here, but, at all events, it would not be felt more than in the manufacture of linen, silk, freize, boots and shoes, in which the Irish excel. It is alleged that the people are irascible, given to combinations, and to outrage; but whatever outrages are perpetrated in Ireland are generally connected with land, religion, or politics, not with trade. There are more offences of this nature among the brickmakers in Lancashire, or the grinders at Sheffield, in a week than in all Ireland in a year.

Do our investors in foreign mines find no difficulty with the natives? Is it not notorious that they encounter such as could never occur in Ireland, where all commercial enterprises are strongly protected by the law, and by the most powerful police force in the world? Let our mining friends pluck up hearts of grace, and turn Ireland inside out. They will find wealth, and possess it; they will themselves be blessed, and be a blessing.

SAFE TRANSPORT AND STORAGE OF PETROLEUM.—A novel invention, and apparatus for preventing explosions of the gas generated from petroleum and similar materials has been patented by Mr. SINIBALDI, of Paris, consisting in storing the oil or spirit in a vessel in such a manner that to be withdrawn from it must be displaced by the introduction of another liquid of different specific gravity, so that there is never any empty space in the vessel above the liquid. The said invention also consists in apparatus composed of a cistern or reservoir of iron or other suitable material in which the petroleum and other oil or spirit is stored, and from which the same is drawn off ready measured.

Meetings of Public Companies.

UNITED BITUMINOUS COLLIERIES COMPANY.

At the extraordinary general meeting of shareholders, held on Aug. 30, the Chairman explained the present position of the undertaking, showing that since last annual meeting the total amount subscribed for shares and debenture bonds (including a profit of 400%, on the sale of bricks) was £24000, nearly all of which had been spent on the works, the directors and secretary postponing their claims for fees and salary for many months, so as to promote the success of the company. He also stated that in the present state of the coal and iron trades the directors considered it most judicious to devote their principal attention to the manufacture of bricks, for which there was large and increasing demand at very remunerative prices, and assured the meeting that if the required capital was subscribed there was every prospect of success, but if the shareholders failed to find what was absolutely necessary to complete the works the company must necessarily be wound-up. Many questions were put and answered to the satisfaction of all present, and it was moved, seconded, and carried unanimously that—

"Having heard an explanation of the present position and prospects of the company, and believing that an expenditure of the sum estimated by the company's engineers in his report dated Sept. 21 last will make the company very remunerative, this meeting strongly recommends the shareholders to subscribe for the debenture bonds still taken, amounting to upwards of £3000, on or before Sept. 11, failing which another meeting should be called to pass a resolution to wind-up the company voluntarily."

The shareholders present, representing upwards of 4000 shares, expressed their approval of the services of the directors and secretary, and passed a cordial vote of thanks to that effect.

TOLIMA MINING COMPANY.

An extraordinary general meeting of shareholders was held, on Wednesday last, at the offices, Finsbury-circus—Mr. BARROW in the chair—for the following purposes:—To receive reports upon the character and value of the alluvial gold deposits at Friars, and the feasibility of obtaining a supply of water adequate for the working of the same; to consider, and if thought advisable, to confirm an agreement executed on April 1 last between the vendors and the company, by the terms of which certain arrangements were entered into with the former for the settlement of their claim to the balance of the contingent purchase-money; to consider the propriety of authorising, and if thought advisable to authorise, the directors to make a call or calls on the A shares to the amount of 10s. still un-called on those shares, notwithstanding that a dividend of 20 per cent. has not been distributed on the capital of the company for two consecutive half-years.

Mr. WILLIAM W. HOLMES (the secretary) read the notice calling the meeting.

The CHAIRMAN said—Gentlemen: As a preliminary observation, I would remark that the directors have thought it desirable to call a special meeting for the purpose of submitting for your consideration the best information we can obtain as to the auriferous deposits situated on the Friars estate, and upon which we hope reliance may be placed. The meeting will also be made special, for the purpose of considering and confirming an agreement entered into by the directors on behalf of the company and the original vendors of the property. When these matters are disposed of I shall be very happy to answer any enquiries you may wish to make upon the company's affairs generally. Perhaps, before I proceed any further I had better ask the secretary to read the two reports—Mr. Anderson's report and Mr. Lucas's report, and also the agreements we have entered into.

The SECRETARY then read the reports, full extracts from which had been given in the circular convening the meeting. He also read the agreement between the company and Mr. W. S. Welton and Mr. W. D. Powles, under date April 1, 1875.

The CHAIRMAN said—Gentlemen: I will allude first to the deposits, and to the reports upon them. You are aware that, for the last two or three years Mr. Welton has from time to time reported upon these gravel deposits, and expressed a very favourable opinion upon them. You have also had an opinion by Mr. Williams, our sub-manager, which was made in 1873, and they are also referred to in the late Capt. Harper's report after he had arrived in that country in the year 1874. They had also been referred to in some of the directors' annual reports, and several discussions had taken place upon them, and, therefore, the consideration of them is not new to you, nor is it a new question. Having obtained all the information in our power, we thought the time had arrived for determining upon the course which should be pursued respecting those deposits. Some of you are, doubtless, aware, but others may not know, that three requisites are necessary for working the alluvial gravel by the hydraulic system. First, the deposits must contain a certain richness of gold, and there must be a sufficient quantity; secondly, there must be a sufficient outlet for the tailings to be carried away; and, thirdly, there must be a maximum quantity of water to work a minimum quantity of gravel, so as to make the working remunerative. You will gather from Mr. Anderson's report that it possesses the two first requisites—namely, a sufficient quantity of gravel of sufficient richness, and that we have a proper outlet for the tailings. Mr. Anderson says nothing better than the existing outlet can be required, which is an important feature in a mine of this description, and you will observe from Mr. Lucas's report that we can possess the third requisite—a sufficient quantity of water in great abundance. So you will observe that it is stated that we have an extensive and rich deposit of auriferous gravel, and we feel convinced that it can be efficiently worked if the agreement which has been submitted to you be confirmed by you this morning. With respect to this agreement which has been just read, I will at once candidly admit that I do not deem it expedient to say more than I can help upon some of the recitals in it; I do not suppose a discussion upon them would benefit either the company or any individual shareholder, especially as you will only await your confirmation to make it binding upon all parties. Probably you may enquire, and very naturally, upon what principle the consideration to the vendors of £3000 A shares has been fixed? I will do my best to give an explanation. Upon the purchase of the property the consideration money (£70,000.) was disposed of as follows—£20,000, was advanced to discharge the mortgage and other liabilities on the Friars estate; £6000 B shares—shares which were deferred in the dividend until the A shares received 10 per cent.—were handed over to the vendors, and those £6000 shares represented 30,000%; and the remaining 20,000%, was not to be paid until the paid-up share capital of the company received dividends at the rate of 20 per cent. for two consecutive half-years. Thus you will see that the vendors did not put any cash into their own pockets upon the transaction. In 1875, in consequence of the Friars Mine not showing the results which were anticipated, and the mine being then poor in ore, an agreement was entered into by which the vendors relinquished forever 10,000%, being the moiety of the contingent money of 20,000%, so as to enable the shareholders to call up that amount and expend that further capital upon their own property. Considering all these circumstances, and the advantage in coming to a final arrangement with the vendors, as well as the advantage we shall derive from the release of the 10s. per share (about 5000%), which I hope will be amply sufficient to enable the company to wash the alluvial deposits, and also considering that no valuation was made of these auriferous deposits at the time of the purchase, and that the vendors received no consideration for them, as they were then undiscovered, the directors do not hesitate to recommend to you to confirm this agreement. I am not aware that I can give you any further information, but I shall be glad to do so if I can. I, therefore, submit this resolution to the meeting.—"The reports of Mr. Anderson and Mr. Lucas, respecting the character and value of the alluvial gold deposits at Friars having been read, as well as an agreement between the company and Mr. W. S. Welton and Mr. W. D. Powles, under date of April 1, 1875, it is resolved that the said agreement executed on April 1 last between the vendors and the company be, and hereby is, confirmed; and that the directors be authorised to make a call or calls upon the A shares of the company to the amount of 10s. still un-called on those shares, notwithstanding that a dividend of 20% per cent. has not been distributed on the capital of the company for two consecutive half-years."—Mr. COBBETT seconded the resolution.

A SHAREHOLDER: Do the vendors abandon all claim upon the 20,000%?

A SHAREHOLDER: What will the sand produce; what was the estimate?

A SHAREHOLDER: 10s. of gold.

Mr. GRAY: Can the company legally issue shares fully paid up?

The CHAIRMAN: No doubt of it.

Mr. GRAY: I always understood that there was the greatest doubt about doing anything of the kind.—The CHAIRMAN: I am not aware of it.

Mr. GRAY: It is a difficulty I have met with again and again.—The CHAIRMAN said he believed that there was no doubt whatever that the shares could be legally issued.

A SHAREHOLDER: According to the report of 1873 there was 10,000t. due to the vendors, and if they received 3000 shares fully paid up that was 15,000t., and he did not quite see that that was a fair arrangement for the company.

A SHAREHOLDER: I understand it was 10,000t. out of 20,000t.; 10,000t. only they surrendered, and now the balance is this 10,000t., for which they have an equivalent in shares to the extent of 15,000t.

The CHAIRMAN: I have given my reasons for the arrangement, which the directors thought was reasonable and fair. It does represent 15,000t., but you must remember that those deposits had not then been discovered; if they had been we should not have got the property for double the amount. You must consider also that the vendors never put a penny in their pockets when they sold the property, and if you look at it in this light, and take the present value of the shares—I do not know what they are selling for, 10s. or 30s., but if you say 10s., you will see they get only 3000t. at the present time, but the vendors are so confident that the gravel deposits will be something very good that they are quite willing to take these shares as shares instead of cash; if they wait until we receive 30 per cent., which I hope to see one day or another—if they wait until that time they would receive 5000t. under the agreement of 1873, and the remainder in shares up to 10,000t.

A SHAREHOLDER: One motive which you have in recommending the acceptance

of this agreement is that the whole vexed question of the proprietorship will then be settled?—The CHAIRMAN: Yes; that is so.

The SHAREHOLDER: If they get the 3000 shares is it understood that the vendors give up all claims?—The CHAIRMAN: Yes; everything is settled.

A SHAREHOLDER asked how it was proposed to work the deposit?—The CHAIRMAN said that Mr. Lucas proposed three methods. He believed they had about 20 inches of water running by this time; Mr. Lucas proposed to take the ditch three miles further, where he could obtain 100 inches, and then it would be for the directors to consider whether they should go six miles further and get a still larger quantity. Mr. Lucas had named certain sums which he estimated the work would cost, but no doubt his estimate was within the mark. The company had got water, and there was a large extent of gravel, and the directors hoped to make a good profit.

A SHAREHOLDER said there was no estimate of how much gold could be got per week or day.

The SECRETARY said that in a letter which was received last year from Mr. Welton that gentleman estimated that, assuming an adequate supply of water were obtained, the return would be 1 lb. weight of gold per hour on what was called the "run of the hydrant."

The CHAIRMAN said the directors did not like to put forward as a report to the shareholders, but that statement was contained in a letter which was received last year from Mr. Welton.

A SHAREHOLDER: Have you any estimate about the probable result of the working?

The SECRETARY said the information was given in the report, in which it was stated—"From the results obtained from the two points opened we can form some idea of the nature and value of the ground, and its adaptability for hydraulic operations on a large scale. It appears from these two small prospects 105-80 ozs. of coarse gold were obtained, value \$1937 7s. 10d.; cost of producing the same by hand washing, 4 in. to 6 in. water, \$80 4s. 10d.; leaving net \$1351 3s. 10d. A result which is certainly most extraordinary, considering the slow and primitive method followed by the native miners. With the amount of water we are using in Malabar the same work could be effected in half-a-day or less; with 200 or 300 inches of water it could be done in about two days, and with the very limited quantity of 100 inches in (say) four to five days wash. This lesser quantity of water would, if applied, give most satisfactory results, as the ground is so rich and easy to run off." He also added that they seemed to make a great point of the extreme friability of the soil.

The CHAIRMAN, in reply to a shareholder, said he thought Mr. Lucas was within the mark in the estimate he had given for obtaining the increased supply of water.

Mr. GRAY asked whether the report for the year ending May, 1875, had been issued?—The CHAIRMAN: No.

Mr. GRAY: Has the dividend of 10 per cent. upon the A shares, for May, 1874, been paid?—The CHAIRMAN replied that it had not.

Mr. GRAY: Then we are one year's report in arrear, and three years' dividend in arrear upon the A shares?

The CHAIRMAN: Yes, but this is a special meeting, and I should be glad to go to an enquiry about the general affairs if you will allow me to finish the special business.

Mr. GRAY said he had an object in making the enquiry. He was in favour of the agreement being carried out, but he did not like working in the dark. He thought they ought not to commit themselves to pay a further 10% per share upon the shares until they had received the report of the directors for the financial year ending May 31, 1875. He thought they ought to pass the resolution now submitted on the understanding that before it was confirmed the directors' report to May last should be sent round to the shareholders. He thought that the results of the realisation which were referred to at the last meeting would have come forward long before this.

The CHAIRMAN said that it took a long time to realise and get an account of the ores sold, and only two days ago the directors had received from Messrs. Fröhling and Göschner an account of the realisation of the last cargo of ore of 1874. At the last general meeting the balance was estimated at something like 7000t., but there was a serious depreciation upon the realisation of the cargoes, and the balance probably would not be more than 2000t. or 3000t. None of the ore from May, 1874, to May, 1875, had yet been realised, therefore if a general meeting were called at the present moment there was not much information which the directors could give the shareholders. The last meeting was held in December last, and the next meeting was not due till December next, and at the proper time the general meeting would then be held. Whether the directors would then be able to declare a dividend would depend entirely upon how the ore turned out.

A SHAREHOLDER said he thought it would be advisable to give the shareholders periodical reports.

The SECRETARY said that every month a report was sent to the mining papers, and also hung up in the office.

The CHAIRMAN said it was important that the agreement should be carried and confirmed without loss of time, else the time for which it held good would expire.

After some further unimportant discussion, the resolution was put to the meeting, and carried unanimously.

A short desultory conversation ensued, in which Mr. H. B. Sheridan, M.P., and other gentlemen took part, and in reply to observations,

The CHAIRMAN said that the miners had broken into some old Spanish workings, which were supposed to be very rich indeed, and he hoped in a few months to see the company in a very different position to that which it was in at present. When the water was cleared out the value of the old Spanish workings would be ascertained.

Mr. GRAY asked whether it was intended to make the call at once?—The CHAIRMAN said he thought they could go on for three months without making a call. He hoped they would get on till the end of the year without making a call.

After some further unimportant discussion the meeting broke up.

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unanimous opinion expressed was strongly in favour of pressing forward the company's rights, it was decided to leave the whole matter in the hands of the board. A vote of thanks to the Chairman and directors closed the proceedings.

SOUTH CARADON MINING COMPANY.

At a general meeting of shareholders, held on Tuesday, at the mine (Mr. T. Kittow in the chair), the accounts for fourth, fifth, and sixth months showed a profit of £15,638.1d. A dividend of 10s.4d. (2s. per share) was declared, and the balance of £244.8s.5d. carried to the credit of next account. The thanks of the shareholders were offered to Mr. Thomas Kittow, the purser, for the energy and ability he has displayed in obtaining the grants for working the sett of West Caradon Mine. The following report was read:

"Sept. 7.—I am glad to say our mine is still looking well, enabling us to return large quantities of rich copper ore, which I see no reason to doubt of our continuing to do. We are getting on with our new 70-in. engine as fast as possible, and hope in about six weeks it will be working, and all the men resume driving in the deeper levels of Rule's south shaft. The leases of the West Caradon Mine sett being now executed, we are in a position to commence operations in this part, which will be done without delay.—J. HOLMAN."

CALDBECK FELLS LEAD AND COPPER MINING COMPANY.

The half-yearly meeting of shareholders was held, on Monday, in the offices, Carlisle. Lieutenant-Colonel SALKELD presided. There were also present—Mr. Banks, of Highmoor House; Mr. R. B. Brockbank; Mr. S. G. Saul, Mr. Gosling, Dr. Ariss; Mr. Calvert, of Warwick Bridge; Mr. Gath (secretary), and Capt. Polglase (the manager of the mine).—The CHAIRMAN briefly moved the adoption of the report and statement of accounts.—Mr. BROCKBANK, in seconding the motion, said he visited the mine about three weeks ago, and what he saw fully bore out the statements in Capt. Polglase's report printed along with the directors' reports. The facts were actually as the captain said, which was a great matter. He was very much surprised to find, in Capt. Polglase's opinion, there was only one lode, not two. Now, previous captains had always given them an idea that there was a north and a south lode, and a plan was drawn by one who was considered a mining authority, showing two lodes. It might be recalled that, by Capt. Hawke's advice and concurrence, they drove a cross-cut south with the view of intersecting the so-called south lode; and Capt. Hawke told them, after having driven a certain distance, that he had driven through the south lode, and he brought them specimens of his products from it. Well, when he (Mr. Brockbank) was at the mine he had the curiosity to ask Capt. Polglase to take him to where the cross-cut was driven, and he certainly could find no south lode. So that he thought Capt. Polglase was warranted in his conclusion that instead of there being a north and a south lode there was only one lode, which had taken a northerly direction a little way, but was again resuming its proper direction further on. This was a capital mistake in the previous management, because the false notion about there being two lodes had led them to embark on heavy expense not only on the cross-cut, but on other works. Speaking of present prospects, he said that the importance of the 90 ft. level consisted largely in this, that the water ran out from there; they had no pumping, and it was going into whole ground, which had not been out cut before, except in the shallow level. Some years ago Capt. Francis put in a new shaft in the hill a long way west; that was with the object of sinking on a bunch of ore which he had ascertained from the shallow level to exist there, and in sinking the shaft he said he had come upon lead. It was now full of water, and they did not know whether there was lead there or not, but if so they had it ahead of them now, and there was a prospect of the mine paying its way. But if there was nothing in that prospect he was afraid the mine was very near fast. They were just getting enough ore now to pay the bare cost of working, and he imagined, unless they had an improvement in the 90, going west, they would soon be fast. If they had an improvement there they would soon be able to pay their way.—The motion was carried unanimously.

A vote of thanks to the Chairman concluded the proceedings.

FOREIGN MINING AND METALLURGY.

A report has obtained currency to the effect that the largest stocks of pig existing in the Grand Duchy of Luxembourg have been purchased—partly by French houses and partly by Belgian houses, among whom may be mentioned commercial bankers and agents. To induce speculators to operate thus upon Luxembourg pig the conclusion must have been formed that pig has reached its lowest point, and there appears to be little doubt upon this head. There was only one chance of witnessing a further fall in the price of Luxembourg pig; this was a possible reduction in coke. But this eventuality can no longer be relied upon, either in Germany or in Belgium, since in both countries coke must now be said, on the contrary, to exhibit firmness. The quantity of pig which has changed hands in the Grand Duchy of Luxembourg in the manner just indicated is said to have been from 20,000 to 25,000 tons. Some hopes are now entertained—and they appear to be pretty well founded—of a little improvement in the pig-iron trade. Several Belgian rolling-mills are said to be about to resume operations, as their transactions are acquiring increased importance. One rolling-mill in the Monceau-Marchiennes group has concluded a contract for 10,000 tons of iron with a single client.

Depression continues to prevail in the iron trade in the Liège district. This depression is aggravated by the fact that business has not yet emerged from the dead season. Orders for domestic qualities of coal have arrived tolerably regularly in the Charleroi group, and some rather considerable deliveries have been made. Coal is generally firm, and as there is an almost complete absence of stocks the firmness in prices will probably become more decided as the season advances. Many coal contracts which terminated at the close of August have been renewed this month at previous rates. Some consumers have preferred to go on without contracts from day to day, but these are the exceptions. Having regard to the period of the year at which we have now arrived, and having regard also to the general condition of the coal trade, a further fall in prices does not appear probable. On the contrary, the chances seem to be in favour of quotations being maintained with firmness. This is evidently the impression of some industrials, who are endeavouring to assure their supplies of combustible for the remainder of the year. The deliveries of coal for brick-making are drawing to a close in Belgium; they still present, however, some importance, and will probably continue to do so for a short further period.

There are more enquiries for than offers of shares in metallurgical companies. Those companies have, of course, done the best of late which have collieries annexed to their workings. The last report of the Couillet Company, for instance, shows that the company's collieries contributed 47,446t. to a gross profit of 78,726t. realised in the company's last financial year. Taking the past year as the basis of the comparison, the rate of capitalisation of the shares of various Belgian coal and iron companies comes out as follows:—Ougrée, 5.02 per cent.; Espérance, 5.39 per cent.; Couillet, 6.13 per cent.; Belgian Colliery and Metallurgical Company, 9.55 per cent.; Sclessin, 9.61 per cent.; and John Cockerill, 12.18 per cent. The expense of maintaining the permanent way on the South Austrian and Upper Italy Railway presented last year an increase of 20,787t., as compared with 1873. Large rail renewals were carried out during the past twelve months. The average rate paid for the coal consumed upon the system last year was 17.16s. per ton, as compared with 17.13s. 6d. per ton in 1873. As regards the current year, however, a sensible saving will, in all probability, be effected in the matter of combustible.

The Aubin mining and metallurgical property, owned by the Orleans Railway Company, produced last year 183,544 tons of coal, 28,462 tons of rails, and 819 tons of argentiferous lead. The various works were conducted with regularity last year. After allowing for certain expenditure for extensions and renewals, the profits realised by the company from its Aubin property amounted last year to 32,144t. The Aubin Works capital account was reduced last year to the extent of 21,582t. by the sale of the Bruniquel Works, and the collection of three annuities or instalments of the amount due in respect of the sale of the Bouquier Mines and Fumel Ironworks, effected in 1873 to the Metallurgical Company of the Vienne.

A Russian railway organ says that an order has just been placed for 2600 tons of steel rails for the St. Petersburg, Warsaw, and Nikolai railways, at 11s. sterling per ton; 2500 tons are to be supplied by the Creuzot works and the rest by English firms. It is also stated that the representatives of two English banking establishments are negotiating in St. Petersburg with a view to taking over the Finland Railway on a lease. The proposal of the Minister of Public Works for a railway from Tiflis to Baku has been reported upon in the Ministerial Committee. The length of the line will be 300 miles, and the total cost of construction will be 3,165,420L. The construction and working of the railway are to be entrusted to the Poti-Tiflis Railway Company.

SMELTING.—Mr. J. HALL, of Chacewater, has patented an improved means for discharging calcined ore from the furnace, or crushed ore from calcining sources, and for washing and separating such ores. The calcined ore falling

from the furnace is first sifted and the finer portions conducted through a tube by means of a screw conveyor into a wetting chamber, where it is cooled by a stream of water. The mixture of ore and water next passes to a separator, the fine ore being conducted to the buddle and the larger portions to be re-stamped, as are also the lumps rejected at the first sifting.

METROLOGICAL REFORM.

Can it not be understood, said President Barnard, of Columbia College, New York, in his excellent and exhaustive work on the Metric System, noticed in the *Mining Journal* some three years since, that nobody of the great party who are seeking metrological reform and perfect international accord on this important subject is bigotedly devoted to the metric system for its own sake, or absolutely determined to yield nothing that is in it, or to accept nothing that is not in it, on any consideration whatever? Their battle is for a common system, be that what it may; but if they believe that common system will be found at last to embrace the main features of the metric system they are not to be told that they shall have nothing else if anything else superadded to it will make it either theoretically or practically better. Again, the same writer acknowledged, as one of the leading savans of the New World very truly remarks, that sweeping propositions are rarely wholly true. It is not a fact that binary subdivisions of weight and measure are always necessarily the best. In small dealings the convenience of buyers and sellers is best consulted when the multiples and submultiples of quantities correspond with the multiples and submultiples of coins.

The enormous advantage which the simplicity of the decimal system offers for rapid calculation has led to the adoption of the French metric system by the men of science in all countries, and by the people generally in many. But for retail dealings the great beauty of the French metric system is lost in the absence of francs and centimes, lire, and centesimi, or their equivalent. The dollar and cent system of America, although decimal, has the smaller coin—the cent—much too large for convenience, and the monetary systems of England, Germany, Russia, and other countries do not accord with the metric system at all. To remove the difficulty with regard to England various propositions have been made, all more or less objectionable and impracticable; but Mr. Gregory, of the Merchants' College, Blackpool, has endeavoured to systematise these so as to form an acceptable whole.* He proposes to substitute the German "Zollpfund" of exactly half a kilo, which has long been successfully adopted in Germany, as a substitute for the British standard pound; whilst for length he would doubly subdivide the metre, firstly into 40 parts, which he calls metric inches, and secondly into centimetres, &c., as usual. Dry measure he would vary in the same way. In fact, the merit of the system, if any, most parts of which have frequently been suggested, though not collectively, is that the names of the weights and measures to which we have been accustomed are retained, though their weights and sizes have been without a single exception altered. The introduction of the system would restore the confusion which was removed when the present imperial standard system was introduced, and which now causes so much inconvenience in the United States. If every tradesman be compelled to provide himself with new weights and measures it would be better to require him to have correct metric weights at once, or if the metric system has not sufficient to recommend it abandon it, but certainly avoid a hybrid system, which has nothing to recommend it except the retention of old and familiar names. In Germany all wholesale business is carried on with the Zollpfund, and its multiples, the centner (50 kilos), and the metric ton (1000 kilos), and the retail trade is carried on as formerly. There is nothing to prevent the same system being adopted in England and America—adopting the metric system in its entirety for commercial dealings generally, but permitting the use (temporarily at least) of existing systems for retail trading.

As an experiment for accustoming workmen to the decimal system, Mr. Gregory's suggestions, and his two-foot rule made up to 90 centimetres instead of something over 61, are excellent, and the fact that this has been recognised by so good an authority as Sir W. G. Armstrong will do much to ensure its use when the metric system is adopted. Sir William writes—"I have received the metric two-foot rule you have sent me. Should the metric system be adopted in this country, as I hope it will be, your rule will afford a very suitable and convenient means of applying it." If it facilitate the application of the system Mr. Gregory has done much good. In assuming that the most ignorant Frenchman knows less what he is doing in buying demi-kilos, or fractions thereof, at so many centimes than when he buys lives for sons, Mr. Gregory is much mistaken, and is much like the Englishman who followed two native children down a street in Paris because they spoke such fluent French—even better than he spoke it himself. Mr. Gregory, moreover, seems to regard decimal calculation as something beyond the ken of ordinary human beings, just as Molière's bourgeois gentilhomme was unaware that he had talked prose all his life. To secure the adoption of the metric system nothing more is required than to convince the masses of the fact that they have calculated decimal all their lives, and that decimal fractions are calculated in the same way as whole numbers.

Mr. Gregory has done much to prove the value of the metric system, and has entitled himself to the best thanks of all true lovers of progress, for although his system is not practicable, nor even simple if it were, his book will do much to teach the relation which our existing weights and measures bear to the metric weights and measures, and thus facilitate the more speedy introduction of the latter.

"British Metric Arithmetic for the High School, the Board School, the Desk, and the Counter." By ISAAC GREGORY, F.R.G.S. London, Paris, and New York: Cassell, Petter, and Galpin.

STEAM-ENGINE—STATIONARY AND PORTABLE.

The general character of Weale's Rudimentary Series is so well known that it will suffice to state that in a newly-issued volume* by Mr. D. KINNEAR CLARK the information contained in Mr. John Sewell's Elementary Treatise on Steam has been judiciously extended and brought down to the present time. While the historical section of Mr. Sewell's treatise has been retained, in consequence of its great interest, all the remainder has been re-written. The mechanical theory of heat is explained and exemplified, and the heat of combustion is given for various combustibles. An extended notice of peat as a fuel has been supplied, and new chapters on steam, steam-boilers, and stationary and portable steam-engines are added. The action of steam in the cylinders of steam-engines, and the conditions required for economically working steam by expansion, as originally investigated by Mr. Clark, are treated in considerable detail. The compound engine is also discussed, in addition to the various classes of single cylinder engines, and the most recent recorded performances of portable engines are given, and there are some interesting particulars concerning traction-engines.

The chapter giving a general account of the action of steam in the cylinder, as represented by the indicator diagram, is particularly valuable one. The method of reading indicator diagrams is better explained than in any other work, and the chapter on compound steam-engines is excellent. With regard to peat, Mr. Clark mentions that the results of a long course of comparative trials of peat and coal during alternate fortnights at Messrs. Guinness's Brewery, in Dublin, proved conclusively that for generating steam the efficiency of the peat is just one-half of that of coal. On the Continent peat is very much used in locomotives, and it has frequently been tried in this country for the same purpose. About 1840 Lord Wilberforce d'Eresby had peat tried in the Hesperus locomotive on the Great Western Railway. This engine was of Hawthorn's return tube construction, and required, it was reported, about a third more of peat than of coke, with equal forces of draught. The peat was of medium quality, and of a brown colour. According to the reports of other trials in locomotives and in steamboats, peat fuel was more effective weight for weight than coal as fuel. There must have been, as Mr. Clark suggests, some mistake in the trials or in the reports, and it is most probable that the efficiency of peat is really about one-half that of coal, taking average quantities.

Taking the book as a whole, it may fairly be said that no point of importance appears to have escaped Mr. Clark's notice, and that every matter of which he treats has been dealt with in a thoroughly clear and concise style, which will be fully appreciated both by students and workmen.

"An Elementary Treatise on Steam and the Steam-Engine, Stationary and Portable." By D. KINNEAR CLARK, C.E.—London: Lockwood and Co., Stationers' Hall-court.

RAILROADS OF THE UNITED STATES.

As a book of reference upon American Railway Securities, the "Manual of Railroads of the United States and Canada" of Messrs. Poor, of New York and London, has for several years past been recognised as an authority, and the eighth annual edition, just issued, will certainly not lessen its reputation. Although a volume approaching a thousand pages in extent, and containing references to many hundreds of different company's lines, the smallest items seem to have received attention. It is remarked that for the first time since the publication of the manual the railroad interests of the country have received a decided check. During the past year only 1940 miles of road were constructed, against 3948 miles for 1873, against 6167 for 1872, and against 9670 for 1871. The earnings have also fallen off, but in a less ratio than the construction. That such a check should have been suffered was inevitable, for with the mania which for several years prevailed throughout the country upon the subject of the construction of railroads it could not be otherwise than that numerous lines should be built where no adequate provision existed for their support. As soon as this was seen to be excessive distrust naturally took the place of the almost unlimited confidence that had prevailed. With the progress of railroads other interests stimulated by their growth, and by the vast expenditures of labour and material required in their construction, had an equally forced and unhealthy development. The check, therefore, which railroads received immediately extended to every department of industry, reducing though not considerably, the earnings of the roads. It is, however, a most gratifying fact that, with a slight decrease in earnings for the past from the previous year, there has been no falling off in the tonnage of the roads. In the competition that has existed there has been a general reduction of rates, but with the low price of labour

* "Manual of the Railroads of the United States for 1875-6. Together with an Appendix containing a full analysis of the Debts of the United States and of the several States." By HENRY V. POOR. Eighth Series. London: The Author's, Gracechurch-street; Sampson Low and Co., Fleet-street.

and material expenses have been so largely reduced that the net earnings have fully equalled those of 1873.

Such are the general results for the year, the details being given in a long series of very complete tables. The gross earnings for the year were \$590,460,016, of which 60 per cent. came from freights, mails, and merchandise, and 40 per cent. from passengers. The operating expenses were 63½ per cent. of gross earnings, or 12½ per cent. on the cost of the roads, and the net earnings were 4% per cent. on the capital stock. The 50 pages of introduction, from which these particulars are taken, form of themselves a treatise which will be read with very great interest not only by the holders of American railway stock, but by all destined now going on at the rate of 1,000,000 per annum, and it is considered that in 1880 the population will undoubtedly equal very nearly 50,000,000, and that if the future is to repeat the past the interest which is to derive the greatest benefit from the progress society is constantly making in the useful arts is that of the railroads.

The volume is one which should be in the possession of every manufacturer of railway material, whether in this country or America, since it will afford him the readiest means of ascertaining where there is an opening for his productions, and at the same time the means of reaching the place arranged upon for the delivery of the goods.

SEXTON'S POCKET-BOOK FOR BOILER MAKERS AND STEAM USERS.

Nothing can give an author so complete a knowledge of what is required by the workman as actual experience of the trade itself, and the fact that Mr. Sexton has been for 20 years engaged in the manufacture and working of boilers, the last 10 years of this time being occupied as foreman boiler maker in one of the most prominent London firms, should suffice to command a ready adoption of the handsome little volume* which he has just issued. There is much truth in Mr. Sexton's observations that few manufacturers, if any, should be conducted under conditions so strictly systematic as that of boiler making, and there are no workmen to whom it is a greater matter of necessity to be familiar with the laws of Nature as they immediately affect their trade than boiler makers. The number of steam-boilers, he says, that prematurely wear out or explode with more or less destruction to life or property—such explosions or premature wear being entirely or partially attributable to insufficient knowledge on the part of the workman or his superintendent—is difficult to estimate, and it will be readily admitted by those who are at all acquainted with the subject that working boiler makers, and in many instances their foremen, are very imperfectly instructed in the extremely difficult duties they have to perform. The pocket-book embraces information on cylindrical boilers, including a series of tables of circumferences of circles of plate from 1-16th to ¼ in. in thickness, increasing by sixteenths, and from 10 in. to 80 ft. diameter, increasing by ½ in. for the first 9 ft.; on punching, making templates, flanging, with tables showing length of bar required for 3-in. angle iron rings, internal welding in general, and proportions of cylindrical boilers. There is, then, a chapter on vertical boilers, caulking, countersinking, &c., interleaving being introduced frequently throughout the book, so as to permit of any necessary notes being made.

The author states that he has endeavoured to make the book all that can be desired to give the mechanic a thorough knowledge of his business, whereby he will save himself much trouble and anxiety, and in very many instances the time and material of his employer. Algebraic signs are not used, all abstruseness and ambiguity is avoided, and really the possessor will not have to make any calculations—a thing to be always avoided during the hurry and excitement of working hours—but we find an answer to every question that in the ordinary course of business can possibly suggest itself. The arrangement and calculations must have involved considerable labour, but Mr. Sexton may be congratulated upon having produced a pocket-book which will assuredly be highly appreciated by his fellow-workmen, and by steam users generally.

* "Sexton's Pocket-Book for Boiler Makers and Steam Users, comprising a variety of useful information for employer and workman, Government Inspectors, Board of Trade surveyors, engineers in charge of works and ships, foremen of manufacturers, and the general steam-using public." By MAURICE JOHN SEXTON, London: E. and F. N. Spon, Charing Cross.

PHOSPHORIC DEPOSITS OF NORTH WALES.—The new number of the "Journal of the Geological Society" contains a paper by Mr. D. C. Davies "On the Phosphoric Deposits of North Wales." The average yield is 46 per cent. of phosphate of lime, in some places reaching as high as 60 per cent., and in others dwindling down to 20 per cent. Mr. Davies considers that, if worked economically, this fertilising deposit may be profitably utilised. The introduction of tramways into the Welsh valleys would facilitate the work of bringing to the market the millions of tons which the deposit contains.

COUNTY TOPOGRAPHIES.—It will be remembered that the Post Office Directories for the several counties, published from time to time by Messrs. Kelly and Co., of Great Queen-street, contain immediately after the name of each township, and before the lists of residents, very interesting topographical sketches, giving the history of the place and notices of the chief attractions. Mr. E. R. Kelly, M.A., F.R.S., has edited these with much care and judgment, and the first three volumes—for Hampshire, Wiltshire, and Dorsetshire—have now been issued in small octavo form, so that they can be made the agreeable companions of railway travellers. The series is intended to embrace all the counties of England, and it should be mentioned that it is only in consequence of their being reprinted from the Directories that it is possible to produce them at the low price—5s. per volume—which, with their handy form, will render them accessible and useful to a very numerous class of readers.

LIFE ASSURANCE STATISTICS.—The third annual edition of the valuable tabular statement of the position and standing of the several Life Assurance Companies, prepared by Mr. T. J. Buse, of Swansea, has just been completed, and will be issued in a few days. The proof just received shows that Mr. Buse has continued his energy in collecting information, the column showing the consecutive order of establishement now containing the names of 125 companies, instead of 109, and there is, of course, a corresponding increase in the other columns. The figures brought out by the tables are very curious; thus there is a company called the Pearl, which seems to have been established in 1864, which stands first for number of policies, which is 41,984, stands 54th in the order for savings, which are but 2125; the Equitable, with 10,816 policies, stands first for savings with 612,752. The total funds of the Pearl amount to \$915,175, the Scottish Widows Fund having \$5,26,554, and the British and London, British Guardian, and Leathenan each \$11,250. Of course, owing to the almost infinite facts which have to be considered in connection with each company, a conclusion as to the stability of any one or other of the companies can only be drawn from the tables, but they are particularly interesting, as showing that life assurance policies are in existence for something near \$500,000,000, of which some 150,000,000, is assured by 12 companies, 20 companies assure but about 150,000, between them, and 92 other companies for the remainder. There are 10 companies with policies out for between 1,000,000 and 2,000,000, 10 between 2,000,000 and 3,000,000, 15 between 3,000,000 and 4,00



PARIS EXHIBITION, 1867.



VIENNA EXHIBITION, 1873.



LONDON EXHIBITION, 1874.



CORNWALL POLYTECHNIC SOCIETY, 1867 and 1878.

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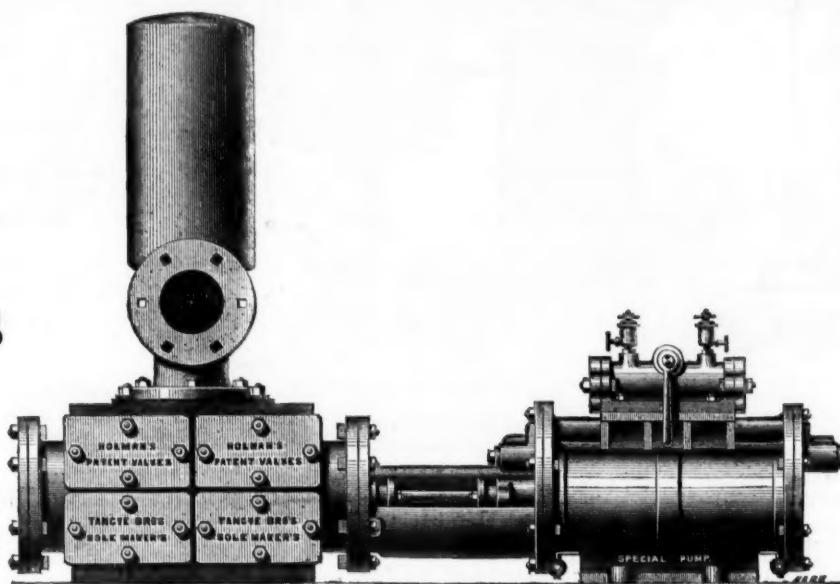
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Diameter of Water Cylinder ...In.	1½	2	3	4	3	4	5	3	4	5	6	3	4	5	6	7	4	5	6	7	8	5	6	7	8	9	5	6			
Length of StrokeIn.	9	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	18	24	12	12				
Gallons per hour	680	815	1830	3250	1830	3250	5070	1830	3250	5070	7330	1830	3250	5070	7330	9750	3250	5070	7330	9750	13,000	5070	7330	9750	13,000	16,519	5070	7330			
Price	£ 16	18	20	25	22	10	27	10	32	10	25	30	35	40	30	35	40	45	50	40	45	50	55	65	50	55	60	70	85	55	60

CONTINUED.

Diameter of Steam Cylinder...In.	10	10	10	10	12	12	12	12	12	12	12	12	14	14	14	14	14	14	16	16	16	16	16	16	18	18	18	18	18	18	
Diameter of Water Cylinder...In.	7	8	9	10	6	7	8	9	10	12	7	8	9	10	12	14	8	9	10	12	14	9	10	12	14	9	10	12	14	12	14
Length of Stroke	12	18	24	24	18	18	18	18	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Gallons per hour	9750	13,000	16,519	20,000	7330	9750	13,000	16,519	20,000	30,000	9750	13,000	16,519	20,000	30,000	40,000	30,000	40,000	13,000	16,519	20,000	30,000	40,000	30,000	40,000	16,519	20,000	30,000	40,000	30,000	40,000
Price	£ 55	75	90	100	75	80	85	110	120	140	110	120	130	140	160	180	180	140	150	160	180	200	190	200	220	240	220	240	24	24	

Intending purchasers of Steam Pumps would do well to observe the great length of stroke, short steam cylinder, and short piston of the "Special" Steam Pump, as compared with the short stroke, long steam cylinder, and long piston of the Pumps of other makers, as the efficiency and durability of the machine, and the space occupied by same, greatly depend upon this. The advantage of long strokes will be obvious when purchasers are reminded that each set of suction and delivery valves of a "Special" Steam Pump with 24 in. stroke, running at 120 ft. per minute, would open and close only 30 times per minute, as against 120 times per minute in a Pump with only 6 in. stroke performing same duty.

The "Special" Steam Pump can be worked by Compressed Air as well as by Steam.

HUNDREDS of these PUMPS are USED for HIGH LIFTS IN MINES, for which purpose they are made with 21, 24, 26, 28, 30, and 32-inch Steam Cylinders, and 36, 48 and 72-inch Strokes.

Holman's Patent Self-acting Exhaust Steam Condensers,

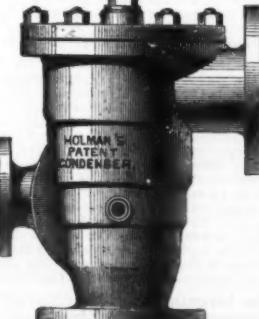
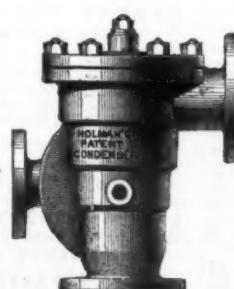
FOR ALL KINDS OF STEAM PUMPS AND HIGH-PRESSURE STEAM ENGINES.

TURNS WASTE STEAM INTO
GREAT POWER.

Saves 20 to 50 per Cent of Fuel.

REQUIRES NO THREE-WAY COCKS,
CHECK, or REGULATING VALVES.SAVES HALF ITS COST IN PIPES AND
CONNECTIONS.PREVENTS ALL ESCAPE OF STEAM IN
MINES OR ELSEWHERE.

REQUIRES NO EXTRA SPACE.



These Condensers are made to suit any size and kind of Steam Pump. They form a part of the suction pipe of the Pump, and while they effectually condense the exhaust steam, they produce an average vacuum of 10 lbs. per square inch on the steam piston, increasing the duty of the Engine, and effecting a saving in fuel of from 20 to 50 per cent.

In Mining operations these Condensers will be of great value.

All Boiler Feeders are recommended to be fitted with these Condensers, as not only is the exhaust steam utilised in heating the feed water, but is returned with it into the boiler.

The following Testimonial gives one Example of the Power Gained by the action of Holman's Patent Condensers:

MORLEY COLLIERY, WIGAN, October 16th, 1874.
MESSRS. TANGYE BROTHERS AND HOLMAN.

GENTLEMEN.—I have great pleasure in recording my entire satisfaction with the working of the Holman's Patent Steam Pump Condenser which you have supplied to us. The complete condensation of the steam is, apart from its value in the strict economic sense, a most valuable feature in the drainage of underground work-

ings. The perfect manner in which this important result is accomplished by your Condenser is extremely creditable to you, and merits the thanks and commendation of the Mining Engineer. When we start the "Special" Steam Pump the Condenser commences working automatically, and maintains a constant vacuum of 10½ lbs. per square inch, even when we run the Pump upwards of 80 strokes (106 feet) per minute. It may perhaps be interesting to you to know that when we were running the Pump at 84 strokes (168 feet) per minute, the steam gauge

indicating a steam pressure of 36 lbs. per square inch, 50 yards from the Pump, and the Condenser vacuum gauge on the exhaust pipe indicating a steady vacuum of 21½ inches, I turned the exhaust steam from the Condenser into the atmosphere, when the speed at once fell to 44 strokes per minute. The working economy thus shown is really so great that the cost of the Condenser must be saved in a very short time. (Signed)

J. THOMPSON.

Price from 30s. to 40s. per inch diameter of Steam Cylinder, according to the relative Diameter of Pump for which Condenser is required.

NORTH OF ENGLAND HOUSE
SOUTH WALES HOUSE

TANGYE BROTHERS AND RAKE, ST. NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.
TANGYE BROTHERS AND STEEL, Tredegar Place, NEWPORT, Mon.; and Oxford Buildings, SWANSEA.

THE "LEVET" ROCK DRILL.

SUPERIOR TO ALL OTHERS.



COPY OF TESTIMONIAL FROM THE ENGINEER, BLANZY MINES, FRANCE. Feb. 25, 1875.

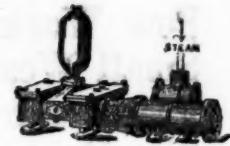
I hereby certify that the new Rock Drill of C. Levet's System has worked at the Blanzy Mines since Nov. 20 without there being the slightest necessity for repair. Its results up to this date have been superior to the other Rock Drills employed in the said mines. (Signed)

THE ENGINEER OF THE MINES, POUMAIRBAU.

THE SACCHARUM WORKS, SOUTHAMPTON.
ANGLO-BAVARIAN BREWERY.

GENTLEMEN.—We have much pleasure in stating that the "STANDARD" Steam Pumps supplied to us for these works, and for our Brewery at Shepton Mallet, give us entire satisfaction. The two first we had from you have been in use for 12 months, and they are still in good working order. THEY ARE ENTIRELY FREE FROM THE NOISE IN WORKING WHICH ALL OTHER STEAM PUMPS WE HAVE TRIED ARE SUBJECT TO; they throw a large quantity of liquor fully equal to the amount named in your Circular, and we can confidently recommend them in preference to any other pumps we have used. Yours truly,

(Signed) HILL, GARTON, AND CO.



FOR PARTICULARS OF
ROCK DRILLS, AIR COMPRESSORS, COAL CUTTERS, "STANDARD" PUMPS,
AND ALL OTHER MINING MACHINERY, APPLY TO
CHARLES HARWOOD & CO.,
St. Stephen's Chambers, Telegraph-street, Moorgate-street,
LONDON, E.C.

GEORGE ANGUS AND COMPANY,
ST. JOHN'S LEATHER AND INDIA-RUBBER WORKS,
NEWCASTLE-UPON-TYNE.

Every description of Leather, India-rubber, and Gutta-percha for Engineering and General Mechanical purposes.

The ONLY PRIZE awarded for "FUEL ECONOMISERS" at the Vienna, Paris, and Moscow Exhibitions, was given to
GREEN'S PATENT FUEL ECONOMISER.

AN INDISPENSABLE APPENDAGE TO STEAM BOILERS.



In operation to
upwards of
2,550,000 h.p.



SAVES
20 to 25 per cent.
of Fuel.



EDWARD GREEN AND SON, Engineers and Sole Makers, 14, St. Ann's-square, Manchester.
ALSO LONDON, GLASGOW, DUSSELDORF, &c.—WORKS: WAKEFIELD.

THE "BURLEIGH" ROCK-BORING COMPANY, LIMITED.

100, KING STREET, MANCHESTER.

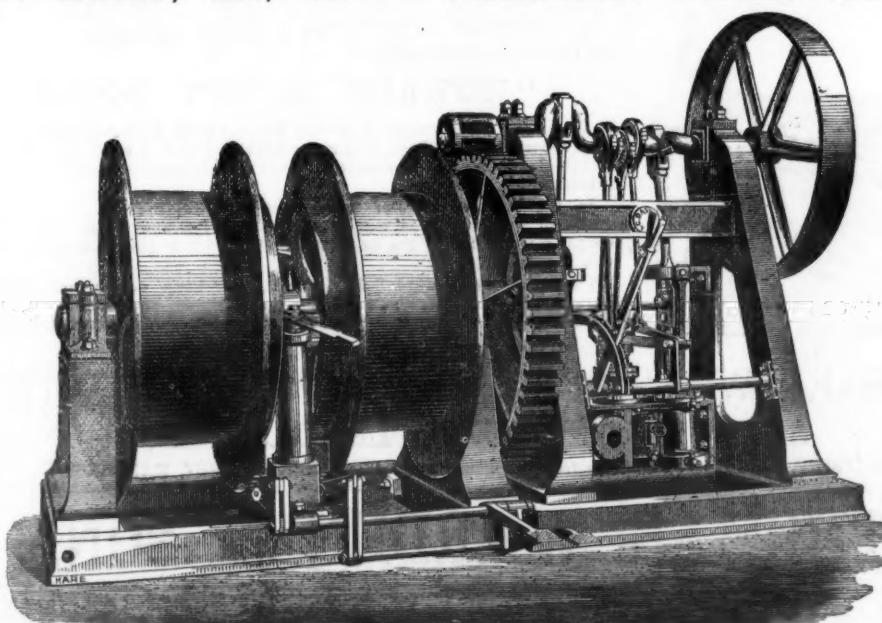
For Sinking Shafts, Cutting Tunnels and Levels, and General Rock Blasting Operations, by contract, and for the Sale or Letting on hire of the
"BURLEIGH" ROCK-BORING MACHINES.

LONDON OFFICE. 96, NEWGATE STREET, E.C.

RICHARD MOTTRAM, SECRETARY.

MESSRS. T. BROWN & CO., ENGINEERS.

I. G. BASS, 18, BOW STREET, SHEFFIELD.



IMPROVED DESIGN of Engine for HAULING, for use with either Steam or Compressed Air.
Takes less room, and can be supplied for less money, than any other Engine of same power.

May also be had with single drum for winding.

DUNN'S ROCK DRILL,

AND
AIR COMPRESSORS,

FOR DRIVING BED ROCK
TUNNELS, SINKING
SHAFTS, AND PERFORMING
OPEN FIELD OPERATIONS,

IS THE
CHEAPEST, SIMPLEST,
STRONGEST, & MOST EFFECTIVE
DRILL IN THE WORLD.
OFFICE,—193, GOSWELL ROAD
(NEAR SPENCER STREET),
LONDON, E.C.

**INCREASED VALUE OF
WATER POWER.**

THE EXTRAORDINARY ADVANCE in the PRICE OF COALS has DIRECTED more ATTENTION to WATER-POWER, and to the BEST MANNER of APPLYING IT. For many years it has been, to a great extent, neglected and undervalued. One great objection to it has been the variable nature of most streams in these countries, having abundance of water during the winter half-year, and very little in the dry season. No kind of wheel hitherto known was able to give the proper proportion of power from the smaller quantities of water, so that it became the practice very generally to use steam entirely during the summer half of the year, letting the water go to waste. This is now completely prevented, and the full available power can be obtained from a stream at every season by using

Mac Adam's Variable Turbine.

This wheel (which is now largely in use in England, Scotland, and Ireland) is the only one yet invented which gives proportionate power from both large and small quantities of water. It can be made for using a large winter supply, and yet work with equal efficiency through all variations of quantity down to a fifth, or even less if required. It is easily coupled to a steam-engine, and, in this way, always assists it by whatever amount of power the water is capable of giving, and, therefore, saves so much fuel.

This Turbine is applicable to all heights of fall. It works immersed in the tall-water, so that no part of the fall is lost, and the motion of the wheel is not affected by floods or back-water.

References to places where it is at work will be given on application to the makers,—

MAC ADAM BROTHERS AND CO.,
ENGINEERS, BELFAST.

Ore Crushers, with H.R.M.'s
New Patent Crushing Jaw.

EXTENSIVELY USED BY
MINE OWNERS.

Few Working Parts.
Small Wear and Tear.
Freedom from Breakage.
Simplicity of Construction.
Excellence of Sample.
Economy of Power.

ALSO,

**ROAD METAL-MAKING
MACHINES,**

WITH
**H.R.M.'s New Patent
Cubing Jaw,**
FOR
REDUCING THE MATERIAL
TO
ANY REQUIRED SIZE.

EXCLUSIVELY ADOPTED BY HER
MAJESTY'S GOVERNMENT.

H. R. MARSDEN, LEEDS, Mining Improvements,
Revolving Picking Table.

ENGINEER,

Immense Saving of Labour.

950 NOW IN USE.

AWARDED 45 GOLD AND SILVER MEDALS.

By the PATENT MACHINE

HERE ILLUSTRATED

60 to 70 Tons of Ore

MAY BE

CRUSHED OR SEPARATED

PER DAY OF TEN HOURS.

EXTRACT FROM TESTIMONIALS:

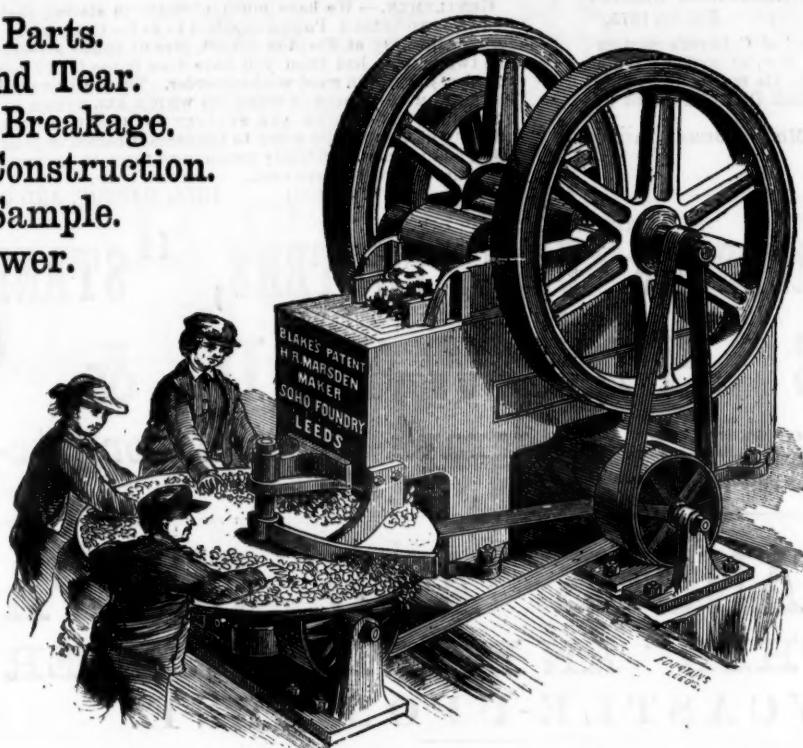
"Although I have travelled hundreds of miles for the purpose of, and spent several days in, examining what are styled ORE CRUSHERS, yours only embrace and combine the true principles of action and construction for the purpose designed."

CATALOGUES FREE on application to

H. R. MARSDEN,

Patentee and Sole Maker,

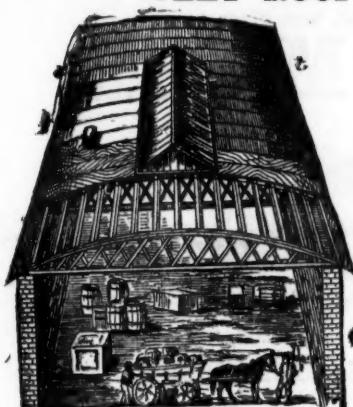
LEEDS.



**M'TEAR AND CO.'S CIRCULAR
FELT ROOFING,**

FOR
GREAT ECONOMY
AND
CLEAR WIDE SPACE.

For particulars, estimates,
and plans, address,—
M'TEAR & CO.,
ST. BENET CHAMBERS,
FENCHURCH STREET,
LONDON, E.C.;
4, PORTLAND STREET,
MANCHESTER;
OR
CORPORATION STREET,
BELFAST.



The above drawing shows the construction of this cheap and handsome roof, now much used for covering factories, stores, sheds farm buildings, &c., the principal of which are double bow and string girders of best pine timber, sheathed with $\frac{1}{2}$ in. boards, supported on the girders by purlins running longitudinally, the whole being covered with patent waterproof roofing felt. These roofs so combine lightness with strength that they can be constructed up to 100 ft. span without centre supports, thus not only affording a clear wide space, but effecting a great saving both in the cost of roof and uprights.

They can be made with or without top-lights, ventilators, &c. Felt roofs of any description executed in accordance with plans. Prices for plain roofs from 30s. to 80s. per square, according to span, size, and situation.

Manufacturers of PATENT FELTED SHEATHING, for covering ships' bottoms under copper or zinc.

INDOROUS FELT for lining damp walls and under floor cloths.

DRY HAIR FELT, for deadening sound and for covering steam pipes, thereby saving 25 per cent. in fuel by preventing the radiation of heat.

PATENT ASPHALTE ROOFING FELT, price 1d. per square foot.

Wholesale buyers and exporters allowed liberal discounts.

PATENT ROOFING VARNISH, in boxes from 3 gallons to any quantity required 8d. per gallon.



By a special method of preparation, this leather is made solid, perfectly close in texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

I. AND T. HEPBURN AND SONS,
ANNERS AND CURRIERS, LEATHER MILLBAND AND HOSE PIPE
MANUFACTURERS,
LONG LANE, SOUTHWAKE, LONDON
Prize Medals, 1851, 1855, 1862, for
MILL BANDS, HOSE, AND LEATHER FOR MACHINERY PURPOSES.

THE GREAT ADVERTISING MEDIUM FOR WALES.
THE SOUTH WALES EVENING TELEGRAM
(DAILY), and
(WEEKLY), established 1857,

the largest and most widely circulated paper in Monmouthshire and South Wales.
CHIEF OFFICES—NEWPORT, MON.; and at CARDIFF.

The "Evening Telegram" is published daily, the first edition at Three P.M., the second edition at Five P.M. On Friday, the "Telegram" is combined with the "South Wales Weekly Gazette," and advertisements ordered for not less than six consecutive insertions will be inserted at an uniform charge in both papers.

P.O. O. and cheques payable to Henry Russell Evans, 14, Commercial-street, Newport, Monmouthshire.

MINING PROSPECTUSES AND ANNOUNCEMENTS OF PUBLIC COMPANIES should be inserted in the BARNSTAPLE TIMES, published every Tuesday, and in the DEVON POST, published every Saturday, as these papers circulate largely throughout Devon and Cornwall, where many thousands of investors reside. Legal and Public Companies' advertisements, 6d. a line each insertion; Trade and Auctions, 4d. a line; Wanteds, &c., 20 words, 1s.

Published by J. B. JONES, Boutport-street, Barnstaple, Devon, to whom all orders by post or telegraph should be sent.

J. WOOD ASTON AND CO., STOURBRIDGE

(WORKS AND OFFICES ADJOINING CRADLEY STATION),

Manufacturers of

CRANE, INCLINE, AND PIT CHAINS,

Also CHAIN CABLES, ANCHORS, and RIGGING CHAINS, IRON and STEEL SHOVELS, SPADES and FORKS, ANVILS, VICES, SCYTHES, HAY and CHAFF KNIVES, PICKS, HAMMERS, NAILS, RAILWAY and MINING TOOLS, FRYING PANS, BOWLS, LADLES, &c., &c.

Crab Winches, Pulley and Snatch Blocks, Screw and Lifting Jacks, Ship Knees, Forgings, and Use Iron of all descriptions.

STOURBRIDGE FIRE BRICKS AND CLAY.

ARTESIAN BORINGS,

For WATER SUPPLY to TOWNS, LAND IRRIGATION, and MINERAL EXPLORATIONS, may be executed of any diameter, from 6 in. to 36 in., and to any depth to 2000 ft.

Pistons & Air-pump Buckets fitted with Patent Elastic Metallic Packing

of which upwards of 8634 have been made to March, 1875.

MATHER AND PLATT,

MAKERS OF LARGE PUMPS AND PUMPING ENGINES.

Improved Valves and Taps for Water, Steam, Gas, &c.

PATENT STEAM EARTH-BORING MACHINE
ENGINEERS and MACHINE MAKERS to CALICO PRINTERS, BLEACHERS, DYERS, and FINISHERS.

SALFORD IRONWORKS, MANCHESTER.

PRICES AND PARTICULARS ON APPLICATION.



IMPORTANT TO STEAM USERS.

THE BARROW SHIPBUILDING COMPANY (LIMITED), having purchased the Patents and Business of the

"HOWARD SAFETY BOILER,"

Desire to call the attention of Steam Users to some important improvements recently introduced in these Boilers, by which any points of objection to previous designs are entirely overcome, whilst the valuable principle, so widely recognised, is retained.

In the improved Boiler there is neither welding or screwing, and the whole of the interior is readily exposed to view and cleaned out. The more simple construction of the improved Boilers admits also of a substantial reduction in price.

Twenty of the Howard Safety Boilers, of 60-horse power each, are in use at Barrow, and altogether about 800 are successfully at work. The Boilers may also be seen at work at Messrs. J. and F. Howard's, Britannia Ironworks, Bedford.

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THE BARROW SHIPBUILDING COMPANY, LIMITED,
BARROW-IN-FURNESS, LANCASHIRE;

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IRON, STEEL, AND GENERAL MERCHANTS,
LIONEL STREET, BIRMINGHAM,

Manufacturers of Anvils, Vices, Hammers, Bellows, Tue Irons, Hydraulic and Screw Jacks, Crabs, Cranes, Spades, Shovels, Picks, Arms and Boxes, Axles, Springs, Hurdles and Fencing, Screw Bolts, Washers, Hames, Chains, Files, Nails, &c., &c.

SECOND-HAND RAILS, AND EVERY DESCRIPTION OF RAILWAY, COLLIERY, AND CONTRACTORS' PLANT
ALWAYS ON HAND.